United States
Department of
Agriculture

Forest Service

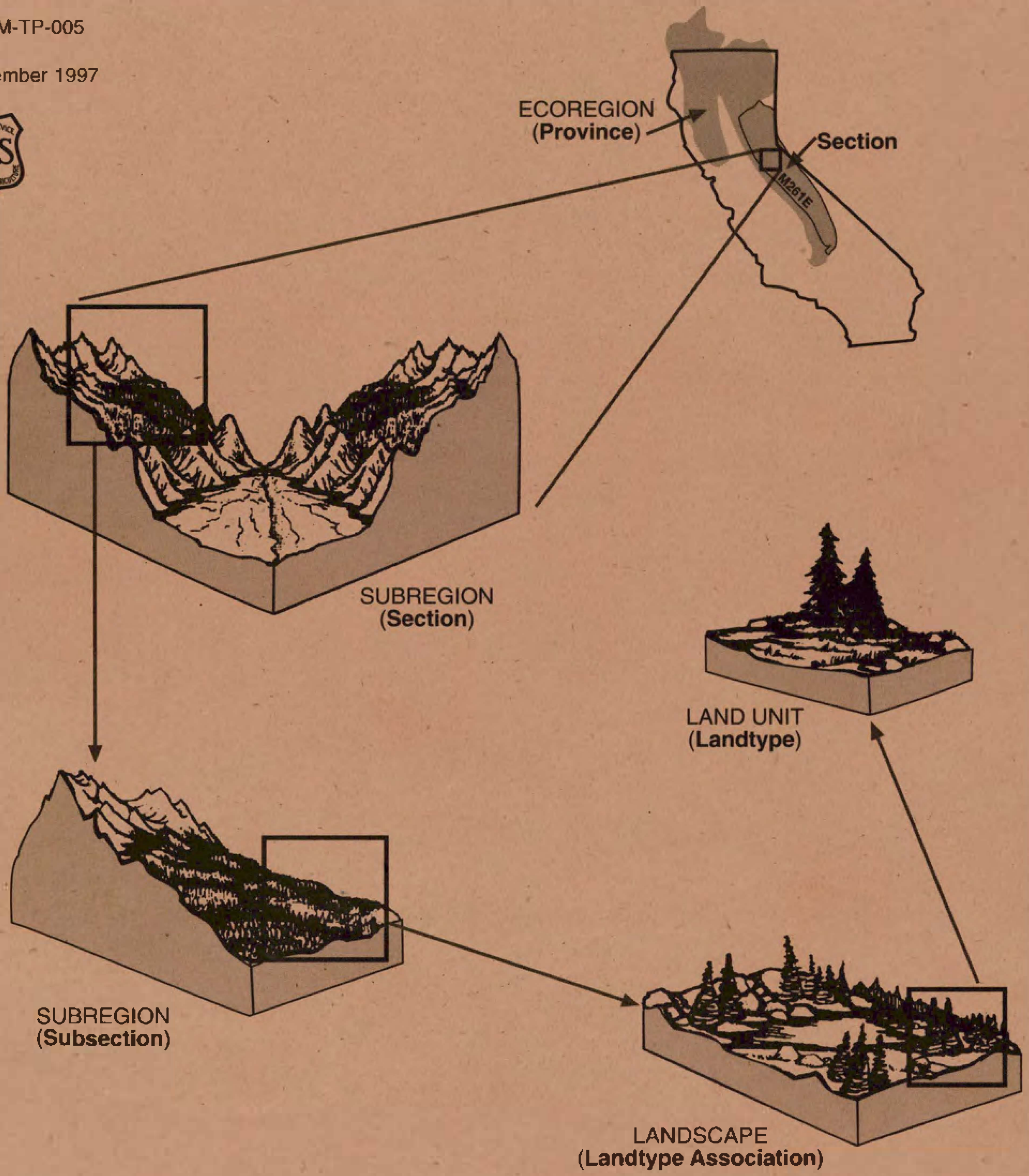
Pacific
Southwest
Region

R5-EM-TP-005

September 1997

Ecological Subregions of California

Section and Subsection Descriptions


ECOREGION
(Province)
Section
M261E
SUBREGION
(Section)
LAND UNIT
(Landtype)
SUBREGION
(Subsection)
LANDSCAPE
(Landtype Association)

Ecological Subregions of California

Section and Subsection Descriptions

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Pacific Southwest Region
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USDA, Natural Resources Conservation Service
USDI, Bureau of Land Management

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Preface and Acknowledgments

Preface

This document contains the biophysical descriptions of the sections and subsections as depicted on the map "Ecological Units of California," (Goudey and Smith, 1994). This represents a subdivision of the ecological units shown on the map "Ecoregions and Subregions of the United States," (Bailey, etal, 1994), and described in "Ecological Subregions of the United States: Section Descriptions," (McNab and Avers,1994). The basis for these maps and documents is the National Hierarchical Framework of Ecological Units (ECOMAP, 1993). This framework provides a standardized method for classifying, mapping, and describing ecological units at various geographic planning and analysis scales in the United States.

This text, which supplements the map by describing the delineated section and subsection ecological units, is the product of collaboration and teamwork by contributors from the Forest Service and other federal agencies in California, State agencies, universities and individuals. Because this document presents information on a wide range of environmental, biological, and cultural characteristics of ecosystems at the subregion scale, many contributors were involved in its development. Each contributor drew upon personal knowledge of environmental relationships and mapping principles and obtained help from other resource specialists to develop these map units and descriptions.

This text should be viewed as a continually evolving and refined draft of our ability to recognize and describe ecosystems at the subregion scale. Because this is the first edition and it was prepared by many persons in a short time, this text undoubtedly contains errors and perhaps omits pertinent information. Also, because our current knowledge of ecosystems is evolving, new relationships will be discovered continually. The Forest Service and Natural Resources Conservation Service are committed to management based on ecological principles and intends to update the subsection map and this text as required. Users are invited to report corrections to this document and present new knowledge applicable to the subsection level in the national hierarchy. Comments and suggestions should be forwarded to the Regional Forester, USDA Forest Service, 630 Sansome Street, San Francisco, CA 94111.

Acknowledgments

The development and completion of this document in a relatively short time period is a direct result of the coordination, persistent efforts, and diligent teamwork of many persons. The maps and text were produced through the collective, diligent efforts of the following individuals.

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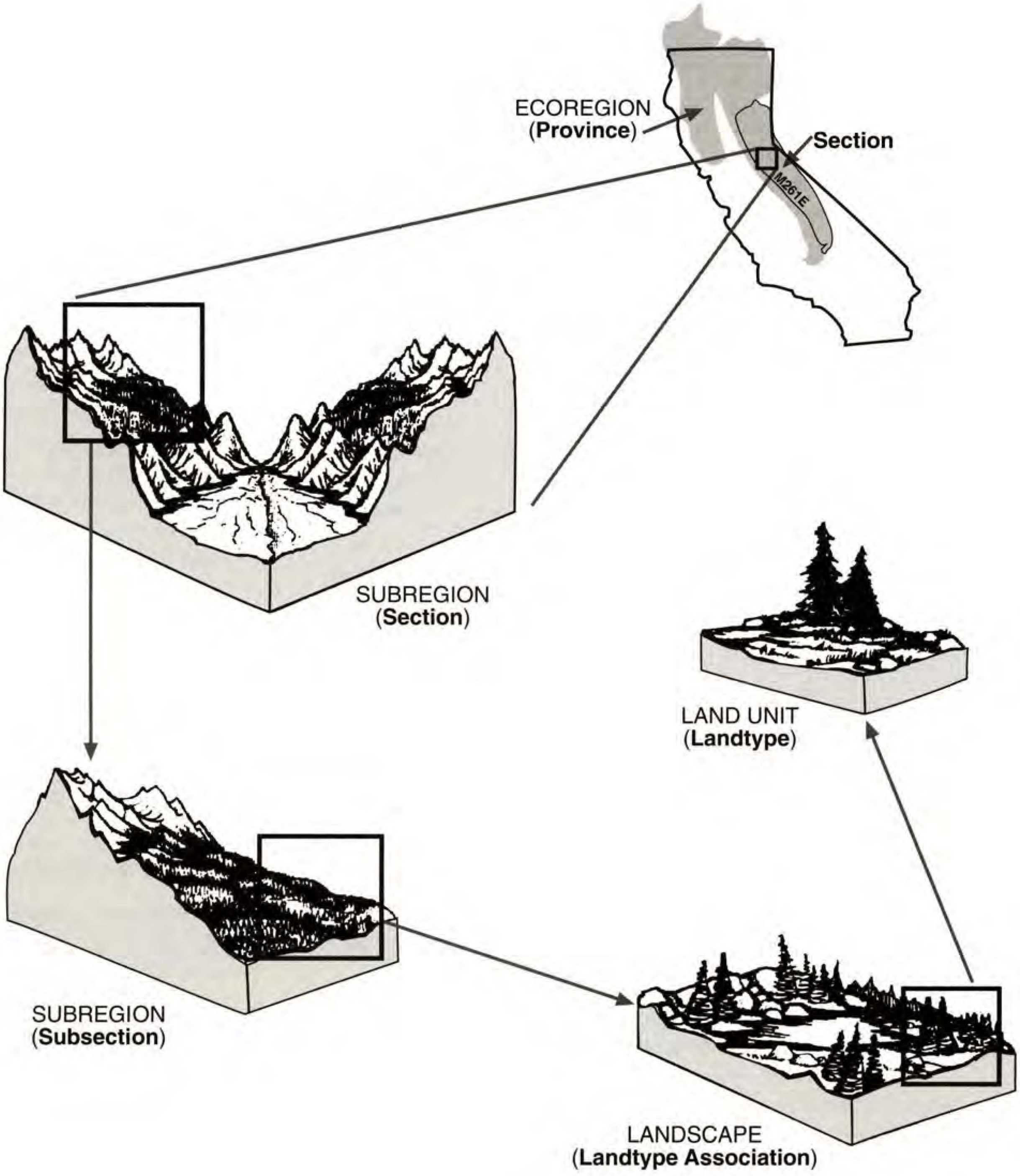
ECOREGION
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(Landtype)
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(Subsection)
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The Forest Service National Hierarchical Framework of Ecological Units is based on this relationship and can be applied at a range of planning and analysis scales, from ecoregion to land unit. A typical ecological unit for each scale is shown in parentheses. (The cover was designed by Mark Windham and Richard Cline, USDA Forest Service. It was modified by Jean Ann Carroll, USDA Forest Service, to depict a California example).

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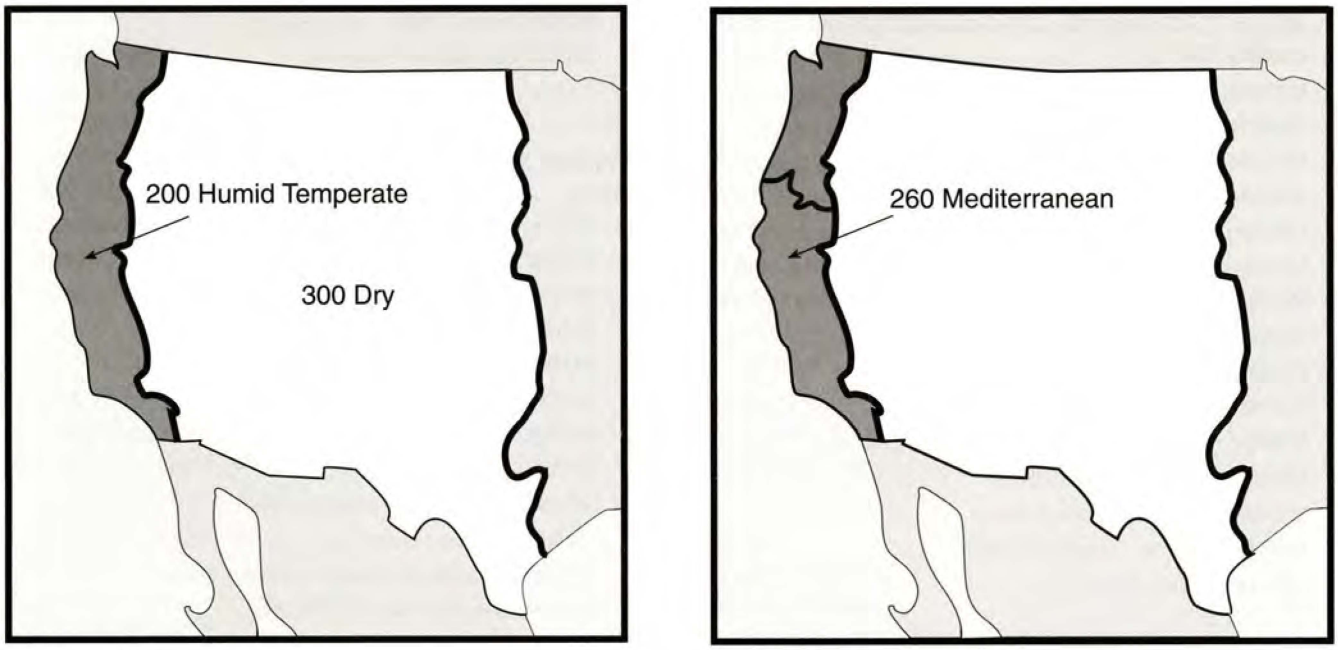
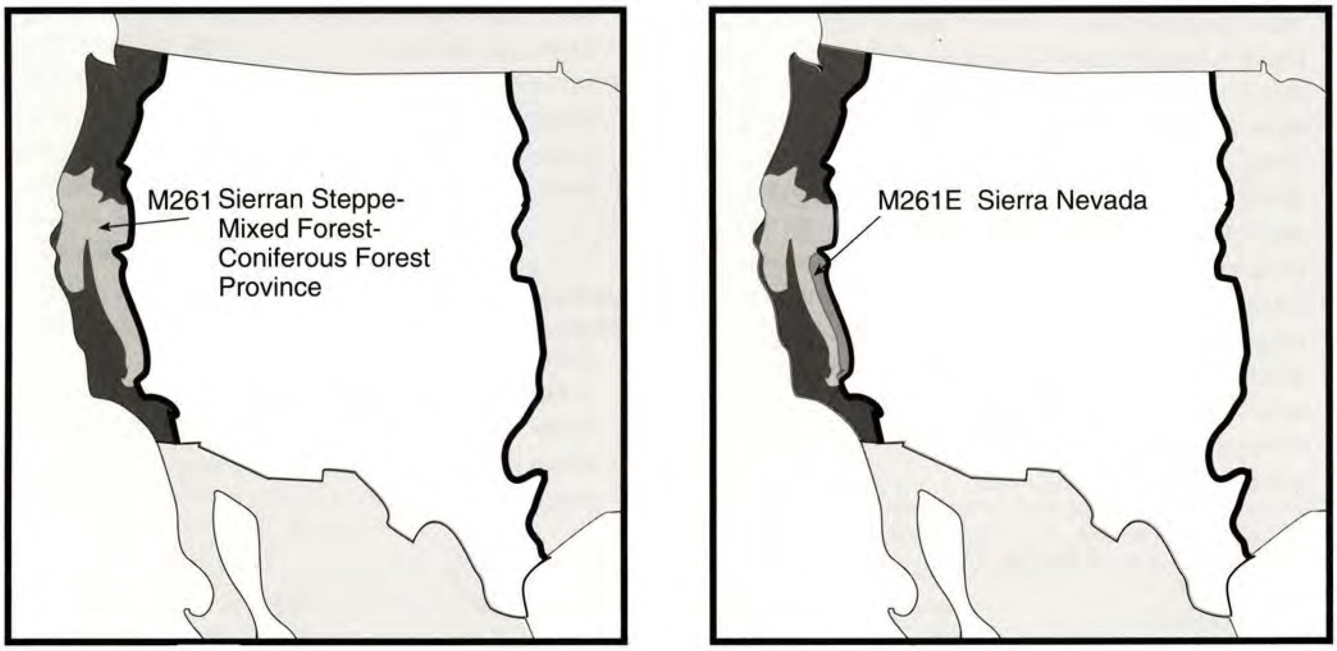
Hierarchy of Ecoregions at a Range of Scales


200 Humid Temperate
300 Dry
260 Mediterranean

a. Domain

b. Division


M261 Sierran Steppe-Mixed Forest-Coniferous Forest Province
M261E Sierra Nevada

c. Province

d. Section

Figure 1 — The upper four levels of ecological units in the Forest Service National Hierarchical Framework consists of Domain, Division, Province, and Section. Selected ecological units of the Humid Temperate Domain, in the western United States, are progressively revealed to the Section level to illustrate the hierarchical structure, the identification system, and relative sizes of map units at the ecoregion and subregion planning and analysis scales (Hierarchy of ecoregions at a range of scales, Bailey, 1994).

Introduction

The USDA Forest Service adopted a policy of ecosystem management on June 4, 1992, that applied to national forests, grasslands and research programs. By July, an Ecological Classification and Mapping Task Team (ECOMAP) was formed in the Washington Office to develop a consistent approach to ecosystem classification and mapping at multiple geographic scales. This was identified by the Chief of the Forest Service as a critical first step in providing field units with an essential tool and scientific basis to plan for and implement ecosystem management. Soon afterwards a subgroup of ECOMAP was formed with representatives from all Forest Service Regions, two Research Stations, the USDA Natural Resources Conservation Service, and The Nature Conservancy. They met in September in Lincoln, NE, to begin development of a land classification system. The structure of the National Hierarchical Framework of Ecological Units (Table 1) was formulated at this meeting and was adopted by the Forest Service on November 5, 1993 (ECOMAP, 1993).

Briefly, as described by ECOMAP (1993), the Framework "...is a regionalization, classification, and mapping system for stratifying the Earth into progressively smaller areas of increasingly uniform ecological potentials. Ecological types are classified and ecological units are mapped based on associations of those biotic and environmental factors that directly affect or indirectly express energy, moisture, and nutrient gradients which regulate the structure and function of ecosystems. These factors include climate, physiography, water, soils, air, hydrology, and potential natural communities."

In November 1992, the subgroup began the process of producing a national map of ecological units at the section level of the subregion planning and analysis scale. During the process of delineating Sections, ecoregion boundaries were revised. The map "Ecoregions and Subregions of the United States" was compiled by December 1993 and printed in June 1994 (Bailey and others 1994). The Section map unit descriptions in this text were produced after the map was compiled. A new, revised ecoregion map was also printed in June 1994. Bailey's publication (Bailey, 1980), which describes the Domains, Divisions, and Provinces of the United States is being revised (Bailey, In prep.).

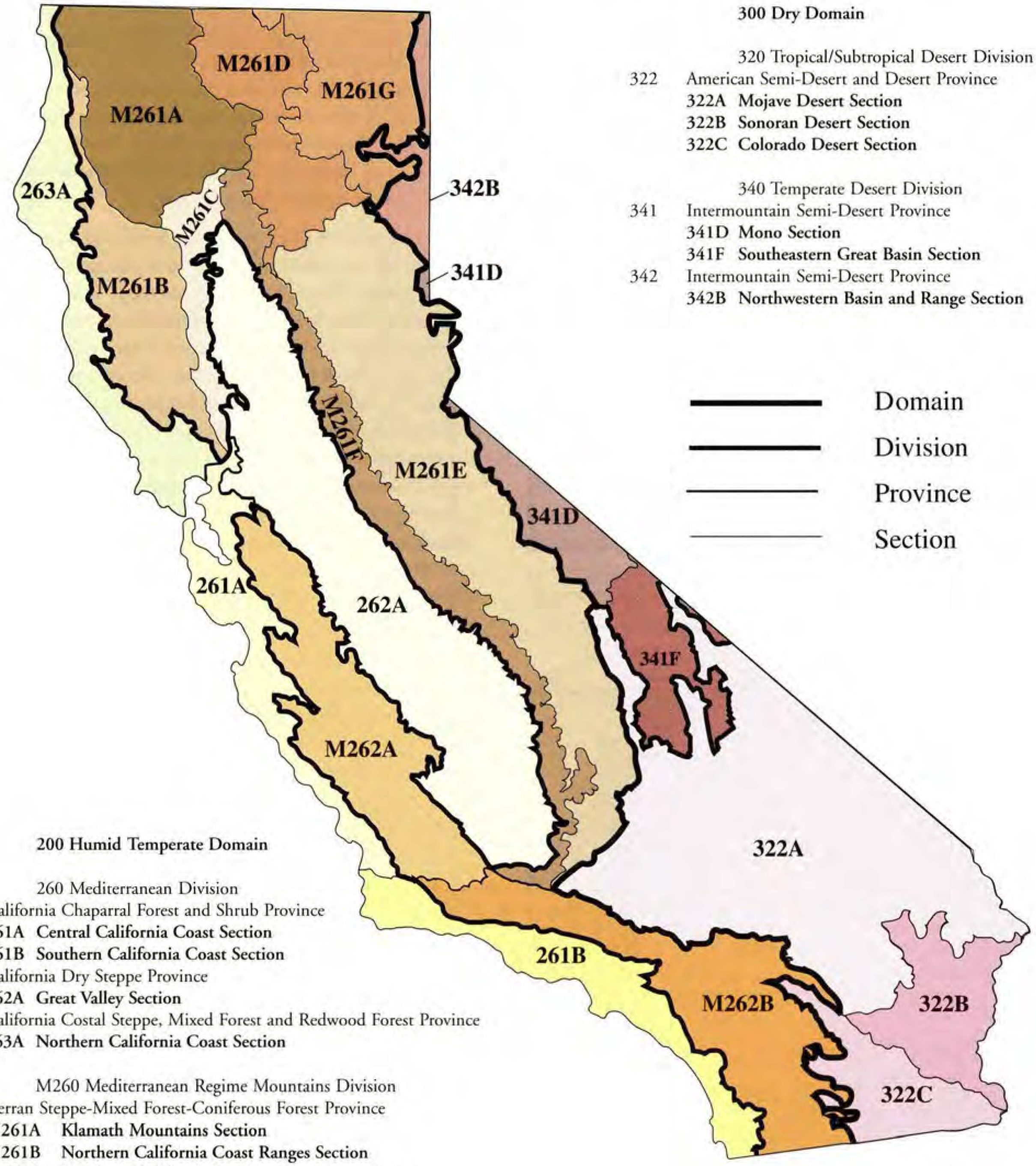
Work began in 1993 by the Forest Service and other agencies to subdivide sections into subsections, the next lower level in the hierarchy. The 1:1 million scale map "Ecological Units of California, Subsections" was published in August 1994. In addition, maps are being developed at landscape and land unit scales on national forests and other selected areas in California to provide detailed information for project implementation. Thus, delineation and description of ecosystems at all levels in the hierarchy are components of an ongoing process that will result in a series of maps and explanatory texts to meet planning and analysis objectives (Figure 1). Each map and each descriptive text documents our current knowledge and provides a basis for study and communication among natural resource managers and planners.

In summary, the National Hierarchical Framework provides a scientific basis for regionalization of ecosystems into successively smaller, more homogeneous units. At the Section level, these units allow managers, planners, and scientists in the Forest Service, and in cooperation with other agencies, to study management problems on a multiforest and statewide basis; organize data collected during broad-scale resource inventories; and interpret these data among regions.

Table 1 - The Forest Service National Hierarchical Framework of Ecological Units

Planning and Analysis Scale	Ecological Units	Purpose, Objectives and General Use	General Size Range
Ecoregion			
Global	Domain	Broad applicability for modeling and sampling, strategic planning and assessment and international planning.	Millions to tens of thousands of square miles.
Continental	Division		
Regional	Province		
Subregion	Section	Strategic, multi-forest, statewide, and multi agency analysis and assessment.	Thousands to tens of square miles.
	Subsection		
Landscape	Landtype association	Forest, area-wide planning and watershed analysis.	Thousands to tens of square miles.
Land unit	Landtype	Project and management area planning and analysis.	Hundreds to less than ten acres
	Landtype phase		

Ecological Subregions of California Sections



300 Dry Domain

320 Tropical/Subtropical Desert Division
322 American Semi-Desert and Desert Province
322A Mojave Desert Section
322B Sonoran Desert Section
322C Colorado Desert Section

340 Temperate Desert Division
341 Intermountain Semi-Desert Province
341D Mono Section
341F Southeastern Great Basin Section
342 Intermountain Semi-Desert Province
342B Northwestern Basin and Range Section

200 Humid Temperate Domain

260 Mediterranean Division
261 California Chaparral Forest and Shrub Province
261A Central California Coast Section
261B Southern California Coast Section
262 California Dry Steppe Province
262A Great Valley Section
263 California Costal Steppe, Mixed Forest and Redwood Forest Province
263A Northern California Coast Section

M260 Mediterranean Regime Mountains Division
M261 Sierran Steppe-Mixed Forest-Coniferous Forest Province
M261A Klamath Mountains Section
M261B Northern California Coast Ranges Section
M261C Northern California Interior Coast Ranges Section
M261D Southern Cascades Section
M261E Sierra Nevada Section
M261F Sierra Nevada Foothills Section
M261G Modoc Plateau Section
M262 California Costal Range Open Woodland-Shrub-Coniferous Forest-Meadow Province
M262A Central California Coast Ranges Section
M262B Southern California Mountains and Valleys Section

Figure 2 — Ecological units delineated at the section level (Ecoregions and Subregions of the United States, Bailey and others, 1994) are the basis for organization of this document. Each chapter consists of a section and its subsection components.

Maps

During 1993, three interdisciplinary teams representing northern, central and southern California drafted subsection boundaries on 1:250,000 scale base maps. Map units were formed using various combinations of line determinants from 1:250,000 scale geology, general soils, topography and vegetation maps, LANDSAT imagery and local personal knowledge. Some information from other map scales was also used. Representatives of the Forest Service and Natural Resources Conservation Service edited the maps for statewide consistency and meeting guidelines. These representatives also met with their counterparts in Nevada to coordinate the development of common ecological units along the California and Nevada state line. This coordination resulted in refinement of the Mono (341D) and Southeastern Great Basin (341F) section boundaries and the identification of subsections within these sections. The Mono section was extended farther to the north and the Southeastern Great Basin section was extended into California. These section boundaries also coincide with Natural Resources Conservation Service major land resource areas (MLRA). Section line refinement from subsection mapping will be reflected in the next update of Ecoregions and Subregions of the United States (Bailey and others, 1994).

A 1:1 million scale map, "Ecological Units of California, Subsections" was compiled from the 1:250,000 scale maps described above and published in 1994 (Goudey and Smith, 1994). This map, and the 1:250,000 scale subsection maps are available in paper or digital form, from the Regional Forester, USDA Forest Service, 630 Sansome Street, San Francisco, CA 94111. Attention Geometronics.

Map Unit Descriptions - Sections

This text is organized following the national hierarchical framework of ecological units. Sections, the highest hierarchical level at the subregion scale (Figure 2), are the basis for chapters. Each chapter begins with a description of the section, followed by descriptions of the subsections which occur in that section. Each section is described by the predominant environmental and biological features used in its delineation, along with other pertinent or characteristic factors. These descriptions are not intended to be detailed, but rather to present enough information to describe the salient features of the units. This information provides the user with a brief description of environmental features that characterize sections for broad planning and assessment and are useful for comparing landscape characteristics among sections. The section map unit descriptions contained in this document have been revised with information brought forward from subsequent description of subsections. Consequently, these section descriptions are considered to be updates to those contained in "Ecological Subregions of the United States: Section Descriptions" (McNab and Avers, 1994). The content of each section map unit description element is described below.

Introductory paragraph. A brief description of the section and its location. The Major Land resource Area (MLRA) which mostly coincides with the section is also listed.

Geomorphology. Geomorphology is the classification, description, nature, origin, and development of present landforms. This element describes the predominant landforms in the section. In some cases, the geomorphic processes involved in forming the characteristic landforms is also described. The geomorphic province in which the section occurs is listed.

Lithology. Lithology is the description of rocks on the basis of such physical characteristics as manner of origin, composition, and texture. The predominant general lithologies and relative age that occurs in the section is listed.

Soil Taxa. Soils are characterized by orders that typify the map unit. Soil moisture and temperature regimes are included to help characterize map units. Soil Taxonomy (Soil Survey Staff, 1992) is the basis for soil classification.

Vegetation. The first paragraph lists the predominant or typifying potential natural community series found in the section. The series are described in "A Manual of California Vegetation" (Sawyer and Keeler-Wolf, 1995). Potential natural community is defined in Appendix C. It is not intended to list all series found within the section, but rather to list those that are common, typical or unique to the section. The series are listed in general order of extent. In some cases, where a number of similar series occur, a descriptive lifeform name is used, for example, mixed chaparral shrublands or sedge meadow communities.

Series that are found throughout the section, but are not restricted to, or extensive in any one subsection are listed alphabetically in the second paragraph. These series may be potential natural communities, or they may be dominated by existing vegetation or exotic plants. The series are described in "A Manual of California Vegetation" (Sawyer and Keeler-Wolf, 1995).

Fauna. Characteristic mammals, birds, reptiles, and amphibians of the map unit are named. Some historic, common, and characteristic species are usually listed. Threatened species are provided for some sections.

Climate. Prevailing climate is characterized in terms of mean annual precipitation in inches and mean annual temperature in degrees Fahrenheit. Seasonality of precipitation and relative amount that occurs as snow may also be presented. The growing season is defined as the mean annual range of days between the last spring and first fall minimum temperatures above 32 degrees Fahrenheit.

Surface Water Characteristics. Relative occurrence and distinguishing characteristics of rivers, streams, lakes, and wetlands are presented. Some major rivers may be identified.

Disturbance Regimes. This element lists the natural factors and forces that significantly influence ecosystem dynamics within a planning period.

Land Use. This element identifies the predominant changes to natural vegetative communities caused by human uses of land and water resources.

Cultural Ecology. Examples demonstrate how the historical relationship between humans and the natural environment has resulted in modified landscapes.

Map Unit Descriptions - Subsections

Each chapter begins with a description of the section, followed by descriptions of the subsections which occur in that section. Each subsection is described by the predominant environmental and biological features used in its delineation, along with other pertinent or characteristic factors. These descriptions are not intended to be detailed, but rather to present enough information to describe the salient features of the units. This information provides the user with a brief description of environmental features that characterize subsections for broad planning and assessment and are useful for comparing landscape characteristics among subsections.

Many potential uses exist for the descriptions of ecosystems presented in this text. Perhaps the most important use is to provide a means for comparison and contrast of environmental conditions among sections or subsections as a basis for region-wide assessment and monitoring programs. Material in this text will provide a common basis for communication and coordination among public agencies and groups at the international, national, state, and local levels of planning and evaluation. Researchers, land managers, and other users of research findings will have a common basis for suggesting limits of applicability of results from experimental studies. Another potential use of information in this document will be to provide a uniform basis for planning areas of coordinated work, especially among a wide range of resource disciplines. When used with related ecosystem maps and companion texts at various scales, information in this document can be used to illustrate the nested relationship of ecosystems, ranging from global to local levels. A single resource classification, such as a geology, soils or a existing vegetation map, may not satisfy all user needs, but an ecological classification can provide greater integrated information.

Some subsection description elements differ from those used in section descriptions. The content of each subsection map unit description element is described below.

Introductory paragraph. A brief description of the subsection and its location. The Major Land Resource Area (MLRA) subunits which mostly coincide with the subsection are also listed.

Lithology and Stratigraphy. Predominant kind, arrangement, age and characteristics of rocks and formations that typify the subsection.

Geomorphology. A description of common landforms and landshapes that occur within the subsection. Adjective terms are used to reflect general slope gradients of major landforms. Terms used to indicate slope groups and approximate gradient ranges, are: nearly level (0-3%), very gently to moderately sloping (3-15%), moderately steep (15-30%), steep (30-70%), and very steep (> 60%). The elevation range within the subsection is given in feet above mean sea level. Major geomorphic processes active in the subsection that resulted in formation of the characteristic landforms are given.

Soils. Soils are mostly identified at the subgroup level according to the list of soil series available at the time (National Resources Conservation Service, 1995). Higher categories are sometimes used to reflect important broad soil characteristics. Most of the soil series were classified before the current *Keys to Soil Taxonomy* (1994 and 1996) was published , which contained significant changes in the classes of Vertisols and Aridisols. It was beyond the scope of this project to present a consistent statewide reclassification of the soil series in these orders at this time. These and other changes in Soil Taxonomy will be included in future revisions of this document. There are small areas of poorly and very poorly drained soils in many of the subsections. These areas may be wetlands that are small, but are locally important. Soil drainage classes, soil moisture and temperature regimes, and sometimes other soil characteristics are given to help characterize the soils. Where certain soil taxa or soil characteristics occur within the subsection is often described.

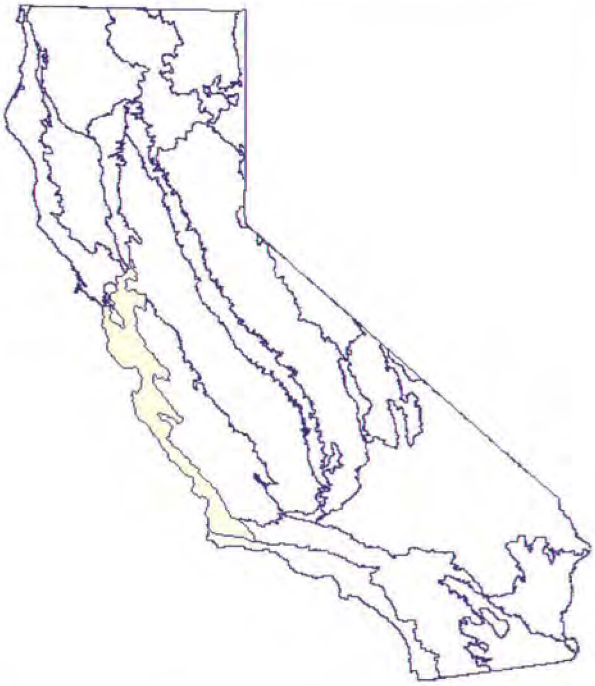
Vegetation. The first paragraph lists the predominant or typifying potential natural community series found in the subsection. The series are described in "A Manual of California Vegetation" (Sawyer and Keeler-Wolf, 1995). Potential natural community is defined in Appendix C. Series dominated by exotic plants are listed when they are extensive and stable. It is not intended to list all series found within the subsection, but rather to list those that are common, typical or unique to the subsection. The series are listed in general order of extent. In some cases, where a number of similar series occur, a descriptive lifeform name is used, for example, mixed chaparral shrublands or sedge meadow communities.

Series that are commonly found in the subsection are listed alphabetically by lifeform in the second paragraph. These series may be potential natural communities, or they may be dominated by existing vegetation or exotic plants. The series are described in "A Manual of California Vegetation" (Sawyer and Keeler-Wolf, 1995). Some series listed in subsections 261Aj, 261Bb, M262Ae and M262Bb are not yet described in the Manual of California Vegetation. For descriptions of these series contact the Forest Supervisor, Los Padres National Forest, 6144 Calle Real, Goleta, CA 93117.

Climate. Prevailing climate is characterized in terms of mean annual precipitation in inches and mean annual temperature in degrees Fahrenheit. Seasonality of precipitation, the relative amount that occurs as snow, or other climatic factors may also be presented. The mean freeze-free period is the approximate number of days between the last spring and first fall minimum temperatures that are above 32 degrees Fahrenheit.

Surface Water. Relative surface water runoff, and the occurrence and distinguishing characteristics of rivers, streams, lakes, and wetlands are presented.

CHAPTER 1



Section 261A
Central California Coast

This section consists of mountains, hills, valleys, and plains in the southern Coast Ranges of California. It is close enough to the Pacific Ocean for the climate to be modified greatly by marine influence. The subsection is mostly in MLRA 14 and partly in MLRAs 4 and 15.

Geomorphology. Parallel ranges and valleys on folded, faulted and metamorphosed strata; rounded crests of subequal height. Coast Ranges geomorphic province.

Lithology. Cenozoic marine and nonmarine sedimentary rocks and alluvial deposits, and Mesozoic granitic and ultramafic rocks.

Soil Taxa. Alfisols, Entisols, Inceptisols, Mollisols, Ultisols and Vertisols in combination with isomesic, mesic or thermic soil temperature regimes and xeric, udic, ustic or aquic soil moisture regimes.

Vegetation. Predominant potential natural communities include the Blue oak series, Purple needlegrass series, Coast live oak series, Chamise series, Valley oak series, Redwood series, Douglas-fir - tanoak series and California sagebrush series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Broom series, California annual grassland series, Cheatgrass series, Eucalyptus series, Giant reed series, Iceplant series, Pampas grass series.
>
> *Series that can occur in all subsections, but are not extensive*: Beaked sedge series, Black cottonwood series, Bulrush series, Bulrush - cattail series, Cattail series, California oatgrass series, Creeping ryegrass series, Duckweed series, Foothill needlegrass series, Mexican elderberry series, Mosquito fern series, Nodding needlegrass series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Purple needlegrass series, Saltgrass series, Sedge series and Spikerush series.
>
> *Series restricted to riparian settings*: Arroyo willow series, Buttonbush series, California sycamore series, Fremont cottonwood series, Mixed willow series, Mulefat series, Narrowleaf willow series, Red willow series, Sitka willow series, White alder series.

Fauna. Mammals include mule deer, bobcat, weasel, fox, skunk, opossum and ground squirrel. Turkey vultures, hawks, owls, herons, egrets, flycatchers, swallows and ravens are common birds. Birds of concern include the brown pelican, lesser tern, osprey, black rail, clapper rail, marbled murrelet, spotted owl and bank swallow. Reptiles and amphibians include the western rattlesnake, common and western aquatic garter snakes, northern and southern alligator lizards and several species of salamanders and frogs. Marine and shore species include sea otter, sea lions, seals, brown

Section 261A, San Luis Obispo area — *Robert Ettner* pelicans, gulls, cormorants, terns and various shore birds. Introduced species includes small populations of fallow deer and barbary sheep. Feral hogs are common throughout large portions of the section.

Elevation. Sea level to 3,800 feet.

Precipitation. 12 to 60 inches.

Temperature. 45 to 60°F. Summer daytime temperatures often modified by morning fog and sea breezes.

Growing Season. 200 to 300 days.

Surface Water Characteristics. Several slow moving, tide affected major rivers in alluvial channels terminate in San Francisco and Monterey Bays. Much of the saltwater marshes on the north and south ends of San Francisco Bay are converted to salt evaporation ponds. A few slow moving perennial streams in alluvial or weak bedrock channels flowing directly to the Pacific Ocean occur in the northern part of the area. Some fast moving perennial streams in weak bedrock channels flowing directly to the Pacific Ocean occur in the southern part of the area. Reservoirs for municipal water supply are common in the northern part of the section.

Disturbance Regimes.
Fire: Fires are of variable frequency, season and intensity.
Seismic Activity: Seismically active area with strong shaking and ground rupture.

Land Use. Composition and successional sequence of some plant communities (especially grassland communities) has changed because of plant and animal species introduced between the late 1700's and early 1900's related to grazing, agriculture, forestry and urbanization. The northern part is densely urbanized.

Cultural Ecology. Humans have been utilizing the section for about 8,000 years, and have been an integral part of central coast ecology for about 2,000 years, thriving on the diversity of habitats from ocean and estuary to forest, and intensively gathering numerous resources. The Spanish established missions throughout the area in the late 1700's and early 1800's introducing agriculture and religious and social changes. The economy is diverse, ranging from San Francisco bay area financial and computer industries to rural agricultural and fishing industries; shipping, tourism and recreation are important industries.

Subsections. The Central California Coast section is divided into 12 subsections.

Subsection 261Aa
Suisun Hills and Valleys

This subsection is an area of low hills north and south of the Carquinez Strait, and includes valleys between the hills, and plains at the west end of the Sacramento-San Joaquin River delta. The climate is hot and subhumid. It is very windy on hills adjacent to and north of the Carquinez Straight. MLRAs 14d and 15d.

Lithology and Stratigraphy. This subsection contains mostly Cretaceous, Eocene, and Miocene marine sedimentary rocks and late Quaternary alluvium, and minor amounts of Pliocene nonmarine sediments and volcanic rocks. The Franklin fault separates Cretaceous and Eocene marine sedimentary rocks in this subsection from Miocene sedimentary and volcanic rocks on the southwest.

Geomorphology. This is an area of steep to moderately steep hills, valleys between the hills, and the edge of a plain that is the floor of the Great Valley. The hills are aligned northwest. The subsection elevation ranges from sea-level up to 1428 feet in the Briones Hills. Mass wasting and fluvial erosion loss are the main geomorphic processes. Fluvial deposition is an important process on recent floodplain and alluvial fans, but most of the stream sediments are washed across the alluvial plain to estuaries of the San Francisco-San Pablo Bay system.

Soils. The soils on hills are mostly Lithic Xerochrepts, Typic Haploxeralfs, and Typic Argixerolls. Chromoxererts are common on moderately steep slopes. Soils on dissected Pliocene and Quaternary nonmarine deposits that are less extensive than those on hills are, in addition to Chromoxererts, Calcixerollic Xerochrepts, Calcic Haploxerolls, Typic Palexeralfs, and Chromic Pelloxererts. Soils on late Quaternary alluvial plains are mainly Typic and Mollic Haploxeralfs, Typic and Chromic Pelloxererts, and Aquic Natrixeralfs. Most, but not all, of the soils on hills are leached free of carbonates,

Subsection 261Aa, northeast of Vallejo — *Charles B. Goudey* but calcium carbonates accumulate in many soils on alluvial plains and more soluble salts accumulated in somewhat poorly drained soil. Soil temperature regimes are thermic (nearly mesic). Soil moisture regimes are mostly xeric with some aquic.

Vegetation. The predominant natural plant communities are Needlegrass grasslands and Blue oak series. On the hills north of the Carquinez Straight it is mostly too windy for trees to survive, particularly on west-facing slopes and summits. Coast live oak series is the predominant natural plant community in most of the Briones Hills. Valley oak series is common on alluvial plains.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.
Shrublands: Coyote brush series.
Forests and woodlands: Blue oak series, Coast live oak series, Valley oak series.

Climate. The mean annual precipitation is about 15 to 20 inches. It is practically all rain. Mean annual temperature is about 56° to 60° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Runoff is rapid from hills, but slow across alluvial plains. All but the larger streams are dry through most of the summer. Natural lakes are absent.

Subsection 261Ab
Bay Flats

This subsection is on parts of the plain at the south end of San Francisco Bay that are less than 10 feet above mean tide level. It is hot and subhumid. MLRA 14d.

Lithology and Stratigraphy. This subsection is on Quaternary bay-fill, mostly silt and clay.

Geomorphology. This is a nearly level delta and estuarine area that is mostly flooded by high tides, or was before artificial barriers were built. The entire subsection is less than about 10 feet above mean sea-level. The main geomorphic processes are coastal marine, and, on the inner edges of the subsection, fluvial.

Soils. The soils are mostly Sulfic Fluvaquents and Endoaquepts, Typic Hydraquents, and Haplaquepts. Soil temperature regimes are isomesic. Soil moisture regimes are aquic.

Vegetation. The predominant natural plant community of the intertidal zone is the Pickleweed series. Saltgrass series is prevalent around the inland margin of the tidal saltmarsh. Sedge meadow communities and Emergent aquatic communities are common on the inner edges of the subsection, away from the bay, or where flooding and drainage patterns have been altered artificially.

Characteristic series by lifeform include:
Saltmarsh vegetation: Cordgrass series, Ditchgrass series, Pickleweed series, Saltgrass series, Sedge series.

Climate. The mean annual precipitation is about 12 to 15 inches. It is all rain. Mean annual temperature is about 58° to 60° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. High tides inundate most of the area. The deltas of Coyote Creek, which drains the Santa Clara Valley, and Alameda Creek, which drains the Livermore - San Ramon Valley, are in this subsection.

Subsection 261Ac
East Bay Hills - Mount Diablo

This subsection consists of Mt. Diablo of the Diablo Range and steep hills west of Mt. Diablo, between the Diablo Range and San Francisco Bay. The subsection is bounded on the southwest by the Hayward fault. It has a hot, subhumid climate. There is moderate marine influence on climate in the East Bay Hills, but that influence diminishes toward Mt. Diablo. MLRAs 14d and 15d.

Lithology and Stratigraphy. Cretaceous, Eocene, and Miocene marine and Pliocene nonmarine sedimentary rocks are predominant. These rocks and Pliocene volcanic rocks in the East Bay hills are folded and faulted. Rocks of the Franciscan Complex dominate the northwest side of Mt. Diablo. The floor of Diablo Valley is covered by late Quaternary or Recent alluvium.

Geomorphology. This is a subsection of northwest trending hills with subequal summits, rounded ridges, steep sides, and narrow canyons. Mt. Diablo and part of Diablo Valley are included in this subsection. The subsection elevation range is from sea-level to about 2000 feet in the East Bay Hills and up to 3849 feet on Mt. Diablo. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are predominantly Typic Argixerolls and Lithic Xerochrepts. Chromoxererts, Pelloxererts, and Calcic Haploxerolls are common in the foothills on the northwest side of Mt. Diablo. Typic Xerochrepts, Typic Chromoxererts, Typic and Chromic Pelloxererts, Mollic Haploxeralfs are common and Aquic Natrixeralfs are present on alluvial fans and floodplains of Diablo Valley and in narrow valleys in the East Bay Hills. Most of the soils are leached free of carbonates, but calcium carbonates have accumulated in some soils in the Mt. Diablo and Diablo Valley areas. The soil temperature regimes are thermic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Coast live oak series in the East Bay Hills, both Coast live oak series and Blue oak series on Mt. Diablo, and Valley oak on alluvial plains. Chamise series is extensive on shallow soils on Mt. Diablo, and the usual natural plant community on Vertisols is Needlegrass grasslands. California sagebrush series is present on shallow soils on south-facing slopes in the East Bay Hills.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.

Shrublands: California sagebrush series, Chamise series, Chamise - bigberry manzanita series, Coyote brush series.

Forests and woodlands: Blue oak series, California bay series, California buckeye series, California sycamore series, Coast live oak series, Fremont cottonwood series, Hinds walnut stands, Mixed oak series, Valley oak series.

Climate. The mean annual precipitation is about 15 to 25 inches. It is practically all rain, except for some snow on Mt. Diablo. Mean annual temperature is about 54° to 60° F. The mean freeze-free period is about 225 to 275 days.

Surface Water. Runoff is rapid from the hills, but slow from the alluvial plains. All but the larger streams are dry through the summer. Natural lakes are absent.

Subsection 261Ad
East Bay Terraces and Alluvium

This subsection is on an alluvial plain that is between the East Bay Hills (subsection M261Ac) and San Francisco Bay. It extends from San Pablo Bay southeast to the Santa Clara Valley. The Hayward fault runs along the northeast edge of the subsection. The climate is hot and subhumid; it is modified greatly by marine influence. MLRA 14d.

Lithology and Stratigraphy. Late Quaternary alluvium predominates in this subsection. There are a few small areas of Quaternary marine sediments. And, there are a few small hills of Franciscan formation rocks - some along the Hayward fault and others surrounded by alluvium.

Geomorphology. The alluvial plain is mostly gently sloping to nearly level alluvial fans. Hills projecting above the fans are steep to moderately steep. The subsection elevation range is from sea-level up to about 600 feet on hills along the Hayward Fault. Fluvial erosion is the main geomorphic process. Fluvial deposition is an important process on recent floodplain and alluvial fans, but most of the stream sediments are washed across the alluvial plain to estuaries of the San Francisco-San Pablo Bay system.

Soils. The main soils are Typic Xerorthents, Entic Haploxerolls, Pachic Argixerolls, Mollic Palexeralfs, Chromic and Typic Pelloxererts, Aquic Natrixeralfs, and Aeric Haplaquepts on the alluvial plain. On hills they are predominantly Lithic Xerochrepts and Typic Argixerolls. Most, but not all, of the soils are leached free of carbonates. Soluble salts accumulate in poorly to somewhat poorly drained soils just above the tide zone. The soil temperature regimes are thermic (nearly mesic). Soil moisture regimes are mostly xeric (nearly ustic), and some aquic.

Vegetation. The predominant natural plant communities are Coast live oak series on hills and California oatgrass series or Needlegrass grasslands on the alluvial plain.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, California oatgrass series, Purple needlegrass series.

Forests and woodlands: Coast live oak series.

Climate. The mean annual precipitation is about 20 to 30 inches. It is practically all rain. Mean annual temperature is about 52° to 56° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Runoff is rapid from hills, but slow across alluvial plains. All but the larger streams are dry through most of the summer. Natural lakes are absent.

Subsection 261Ae
Santa Clara Valley

This subsection is on an alluvial plain in the Santa Clara Valley that extends from Hollister to San Francisco Bay, plus an alluvial plain along the southwest side of San Francisco Bay. It includes a small area of moderately steep hills just west of Hollister and a small area of Quaternary terraces in the San Benito Valley just southwest of Hollister. The climate is hot and subhumid; it is modified greatly by marine influence. MLRA 14d.

Lithology and Stratigraphy. Late Quaternary alluvium is predominant. There are small areas of Pliocene and Pleistocene nonmarine sediments.

Geomorphology. The alluvial plain is mostly gently sloping to nearly level floodplain and alluvial fans. There is a small area of low, moderately steep hills between the Santa Clara and San Benito Valleys, and a small area of Quaternary stream terraces along the San Benito River. The subsection elevation range is from sea-level up to about 250 feet on the alluvial plains and up to about 1000 feet on the hills west of Hollister. Fluvial erosion and deposition are the main geomorphic processes.

Subsection 261Ae, near Gilroy — *Robert Ettner*

Soils. The soils are mostly Typic Xerorthents, Typic Calciaquolls, Typic and Mollic Haploxeralfs, Fluvaquentic Haploxerolls, Typic Pelloxererts, and Typic Palexeralfs. On hills they are mostly Chromic Pelloxererts, Typic Argixerolls, and Typic Palexeralfs. Most, but not all, of the soils are leached free of carbonates. The soils are mostly well drained, but some are somewhat poorly to moderately well drained. Soluble salts accumulate in poorly to somewhat poorly drained soils just above the tide zone, and there are small areas of Natrixeralfs not far above the tide zone. The soil temperature regimes are thermic (nearly mesic). Soil moisture regimes are mostly xeric (nearly ustic).

Vegetation. The predominant natural plant communities are Valley oak series and California oatgrass series or Needlegrass grasslands. Coast live oak series, Needlegrass grasslands, and Blue oak series occur on hills and terraces.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, California oatgrass series, Purple needlegrass series.

Forests and woodlands: Blue oak series, Coast live oak series, Valley oak series.

Climate. The mean annual precipitation is about 12 to 20 inches. It is practically all rain. Mean annual temperature is about 56° to 60° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Runoff is rapid from hills, but slow across alluvial plains. All but the larger streams are dry through most of the summer. Natural lakes are absent.

Subsection 261Af Santa Cruz Mountains

This subsection is the western and southwestern parts of the Santa Cruz Mountains, between the San Andreas fault and the Pacific Ocean. The climate is temperate to hot and subhumid to humid; it is very mild, because of prevalent marine effects. MLRAs 4c and 15d.

Lithology and Stratigraphy. This subsection is on predominantly Mesozoic and Tertiary marine sedimentary rocks over granitic basement of the Salinian block that is exposed on Montara Mountain. The Tertiary sedimentary rocks are Eocene, Oligocene, Miocene, and Pliocene. There are relatively smaller areas Miocene volcanic rocks, Quaternary marine terraces, and late Quaternary or recent alluvium.

Geomorphology. This is a subsection of northwest trending mountains with rounded ridges, steep sides, and narrow canyons. The crest of the mountain range is near the northeast edge of the mountain range, parallel to the San Andreas Fault, which is along the northeast side of the Santa Cruz Mountains. Most of the streams drain toward the southwest. There are some dissected marine terraces along the coast, and some recent alluvium on narrow floodplains and terraces. The subsection elevation range is mostly from sea-level to about 2000 feet, and up to 3231 feet on Castle Rock Ridge. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Pachic Ultic Haploxerolls, Dystric Lithic Xerochrepts, Ultic Haploxerolls, and Ultic Argixerolls with mesic soil temperature regimes; Pachic Haploxerolls and Typic Argixerolls with thermic soil temperature regimes; and Lithic Haplustolls, Ustic Dystropepts, Pachic Hapustolls and Argiustolls, Ultic Haplustalfs, and Ultic Tropudalfs with isomesic soil temperature regimes. In granitic terrain of Montara Mountain the soils are mostly Lithic and Typic Haplustolls and Pachic Argixerolls. On marine terraces, the soils are mostly Xeric Argialbolls, Pachic Argixerolls, and Mollic Palexeralfs. The soils are well drained, and most are leached free of carbonates. Soil temperature regimes are mostly mesic and isomesic, with some thermic. Soil moisture regimes are mostly ustic and xeric (nearly ustic), and some are udic.

Vegetation. The predominant natural plant communities are Redwood series and Douglas-fir - tanoak series. Coast live oak series is common on the northeast side of the mountains. California oatgrass series and Coyote brush series are common adjacent to the coast, and Yellow bush lupine series is present on stabilized dunes. Chamise series and Manzanita shrublands are common on shallow soils and on south-facing slopes.

Characteristic series by lifeform include:

Dune vegetation: Dune lupine - goldenbrush series, Native dunegrass series, Sand-verbena - beach bursage series, Yellow bush lupine series.

Grasslands: California annual grassland series, California oatgrass series, Introduced perennial grassland series, Pacific reedgrass series.

Shrublands: Blue blossom series, California sagebrush series, Chamise series, Coyote brush series, Deer brush series, Woollyleaf manzanita series.

Forests and woodlands: California bay series, Coast live oak series, Douglas-fir - tanoak series, Douglas-fir series, Knobcone pine series, Ponderosa pine series, Redwood series, Santa Cruz cypress stands.

Climate. The mean annual precipitation is about 20 to 60 inches. It is practically all rain, except for some snow on at higher elevations. Summer fog is common. Mean annual temperature is about 50° to 58° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Runoff is rapid and streams on the northeast side of the mountains are generally dry during the summer, but streams on the seaward side are generally perennial. There are natural lakes, or sag ponds, in the San Andreas fault zone, and ponds behind dunes along the coast.

Subsection 261Ag
Leeward Hills

This subsection is on the interior, or northeast, side of the Santa Cruz Mountains that is between the San Andreas fault and the alluvial plain in the Santa Clara Valley and at the south end of San Francisco Bay. It is much drier than the seaward side of the mountains (subsection 261Af). The climate is hot and subhumid, with moderate marine influence. MLRAs 14d and 15d.

Lithology and Stratigraphy. This subsection consists mostly of folded, faulted, and generally metamorphosed sediments and volcanics of the Franciscan Complex and less extensive Cretaceous sediments of the Great Valley Sequence. There are dissected Plio - Pleistocene nonmarine sediments along the lower, or northeast, margin of the subsection, and small areas of Tertiary (Miocene etc.) marine sediments.

Geomorphology. This is a subsection of northwest trending mountains and hills with steep sides and narrow canyons. The crest of the mountain range is near the northeast edge of the mountain range, parallel to the San Andreas Fault, which is along the northeast side of the Santa Cruz Mountains. Most of the streams on the leeward side that drain toward the northeast are relatively short. The San Andreas fault is near the southwest edge of the subsection, but generally in the adjacent subsection. The subsection elevation range is from about 200 feet up to 3790 feet on Loma Prieta. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic Xerorthents, Lithic Ruptic - Xerochreptic Haploxeralfs, and Ultic Haploxeralfs. On Tertiary marine and Plio-Pleistocene nonmarine sediments, they are mostly Xerorthents, Typic Haploxeralfs, and Typic Argixerolls. The soils are well drained, and most of them are leached free of carbonates. Soil temperature regimes are mostly thermic (nearly mesic), and some mesic. Soil moisture regimes are xeric (nearly ustic).

Vegetation. The predominant natural plant communities are Coast live oak series and California bay series on north-facing slopes, Blue oak series on south-facing slopes, and Chamise series on shallow soils.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Chamise series, Coyote brush series.

Forests and woodlands: Blue oak series, California bay series, Coast live oak series, Mixed oak series.

Climate. The mean annual precipitation is about 15 to 30 inches. It is practically all rain, except for some snow on at higher elevations. Mean annual temperature is about 50° to 60° F. The mean freeze-free period is about 225 to 275 days.

Surface Water. Runoff is rapid and the streams are generally dry during the summer. There are no natural lakes, but numerous reservoirs.

Subsection 261Ah
Watsonville Plain - Salinas Valley

This subsection is on an alluvial plain on the east side of Monterey Bay and the alluvial plain of the Salinas Valley. The climate is modified greatly by marine influence. MLRAs 14d and 14e.

Lithology and Stratigraphy. Pleistocene, and some Plio-Pleistocene, nonmarine deposits and recent alluvium are predominant in this subsection. There is a relatively small area of Quaternary marine deposits on the north side of Monterey Bay, and dune sand around the bay that is fairly extensive on the southeast side of the bay.

Geomorphology. The alluvial plains are mostly gently sloping to nearly level floodplain, stream terraces, and alluvial fans in the Salinas Valley, and also dissected Quaternary nonmarine deposits on the Watsonville Plain. Quaternary marine terraces are present around Capitola. There are recent dunes along the west side of Monterey Bay and stabilized dunes on the southeast side of the bay. The subsection elevation range is from sea-level up to about 1000 feet on alluvial fans in the Salinas Valley. Fluvial erosion and deposition are the main geomorphic processes. Wind is an active geomorphic agent along the west side of Monterey Bay.

Subsection 261Ah, near Greenfield — *Robert Ettner*

Soils. The soils are mostly Fluventic, Fluvaquentic, and Pachic Haploxerolls and Typic and Chromic Pelloxererts on floodplains. They are Entic, Typic, and Pachic Haploxerolls, Ultic Palexerolls, and Typic Natrixeralfs on stream terraces and old alluvial fans. Xeric Argialbolls, Pachic Argixerolls, and Mollic Palexeralfs are the main soils on marine terraces. Alfic Xeropsamments and Psammentic Haploxeralfs are the main soils on stabilized dunes. Most, but not all, of the soils are leached free of carbonates. Soluble salts accumulate in some soils that are near the ocean. The soils are mostly well drained, but some on floodplains are poorly drained. Soil temperature regimes are mostly thermic (nearly mesic), and some isomesic near the ocean. Soil moisture regimes are mostly xeric (nearly ustic), but some are aquic on floodplains.

Vegetation. The predominant natural plant communities are Valley oak series and Needlegrass grasslands in the Salinas Valley and Coast live oak series and California oatgrass series on the Watsonville Plain. There are Cottonwood woodlands in riparian areas along the Salinas River. The dunes support a succession of plant communities, from bare dune through herbaceous communities and Coyote brush series to California sagebrush - black sage series on stabilized dunes on the southeast side of Monterey Bay. There is some Pickleweed series in estuaries.

Characteristic series by lifeform include:

Dune vegetation: Dune lupine - goldenbrush series, Native dunegrass series, Sand-verbena - beach bursage series, Yellow bush lupine series.

Saltmarsh vegetation: Cordgrass series, Ditchgrass series, Pickleweed series, Saltgrass series, Sedge series.

Grasslands: California annual grassland series, California oatgrass series, Pacific reedgrass series, Purple needlegrass series.

Shrublands: Blue blossom series, California sagebrush series, California sagebrush - black sage series, Woollyleaf manzanita series.

Forests and woodlands: Coast live oak series, Fremont cottonwood series, Mixed willow series, Valley oak series.

Climate. The mean annual precipitation is about 12 inches in the Salinas Valley up to about 30 inches on the northeast side of Monterey Bay. It is practically all rain. Summer fog is common. Mean annual temperature is about 56° to 58° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Runoff is slow across the alluvial plains. All but the larger streams are dry through most of the summer. Natural lakes are absent, although there is temporary ponding behind sand dunes.

Subsection 261Ai
San Francisco Peninsula

This subsection is the north end of a peninsula that is between the southern part of San Francisco Bay and the Pacific Ocean. The climate is temperate and subhumid; it is modified very greatly by marine influence. MLRA 15d.

Lithology and Stratigraphy. This subsection is predominantly folded, faulted, and generally metamorphosed sedimentary and volcanic rocks of the Franciscan Complex that are largely covered by Pleistocene sediments, dune sand, and, on the bay side of the peninsula, recent alluvium.

Geomorphology. This subsection is just northeast of the San Andreas fault. San Bruno Mountain, San Miguel Hills, Twin Peaks, and a few low hills of Franciscan rock are surrounded by a plain that is Quaternary marine and dune sand deposits. There is some recent alluvium on the bay side of the peninsula. The subsection elevation range is from sea-level to a little over 1000 feet on San Bruno Mountain. Fluvial erosion is the main geomorphic processes. Fluvial deposition is an important process on recent alluvial plains in and above the tidal zone on the bay side of the peninsula. Wind has been an active geomorphic agent and still is on the west side of the peninsula.

Soils. The soils are mostly Lithic Haplustolls and Pachic Argiustolls on bedrock, Ustic Dystropepts on marine sediments, and Psamments on stabilized dune deposits. Xerorthents and Pachic Argixerolls predominate on bedrock and marine terraces on the bay side of the peninsula. Soils in alluvium adjacent to the bay are Fluvaquents, and Hydraquents. Much land has been created in the last century by the addition of fill to the bay. Most, but not all, of the soils are leached free of carbonates. Soluble salts accumulate in some soils that are in or near the tidal zone. The soils are mostly well drained, except some in alluvium adjacent to the bay. The soil temperature regimes are isomesic, and possibly some thermic on the bay side of the peninsula. Soil moisture regimes are mostly ustic, but xeric on the bay side of the peninsula.

Vegetation. The predominant natural plant communities are California oatgrass series and Coast live oak series on hills, with California sagebrush series on shallow soils, and California oatgrass series on alluvial plains. The dunes support a succession of plant communities, from bare dune through herbaceous communities and Coyote brush series. There is some Pickleweed series in estuaries along San Francisco Bay.

Characteristic series by lifeform include:

Dune vegetation: Dune lupine - goldenbrush series, Native dunegrass series, Sand-verbena - beach bursage series, Yellow bush lupine series.

Saltmarsh vegetation: Cordgrass series, Ditchgrass series, Pickleweed series, Saltgrass series, Sedge series.

Grasslands: California annual grassland series, California oatgrass series, Pacific reedgrass series.

Shrublands: Blue blossom series, California sagebrush series, Coyote brush series.

Forests and woodlands: California bay series, Coast live oak series.

Climate. The mean annual precipitation is about 20 to 25 inches. It is practically all rain. Summer fog is common. Mean annual temperature is about 56° to 58° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Runoff is rapid from the hills and slow across the alluvial plains. Streams are dry through most of the summer. There is little overland flow from the area of stabilized dunes. Natural lakes are absent, other than ponding behind sand dunes.

Subsection 261Aj North Coastal Santa Lucia Range

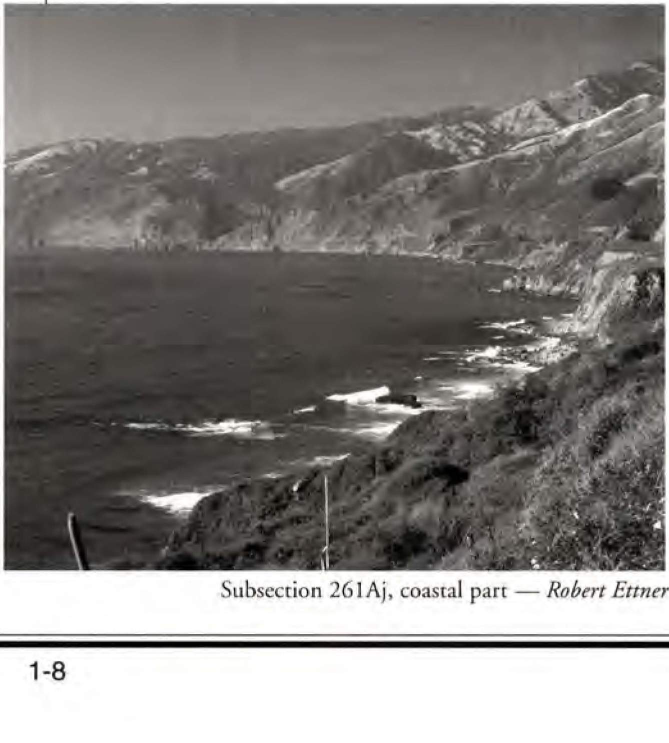
This subsection is the northern part of the Santa Lucia Range. It is on the coastal side of the mountain range, between the Salinas Valley and the Pacific Ocean. The climate is hot to temperate and subhumid to humid, and is modified greatly by marine influence. MLRAs 4c, 14d, 15c, and 15d.

Lithology and Stratigraphy. This subsection is mostly on the Salinian Block, between the San Andreas and Nacimiento faults. It is predominantly Mesozoic granitic and pre-Cretaceous metamorphic rocks. There is some Cretaceous sedimentary rock of the Great Valley Sequence, considerable Miocene marine sediments, and some other Tertiary sediments. Also, there are some rocks of the Franciscan Complex on the southwest edge where the subsection crosses the Sur-Nacimiento fault zone.

Geomorphology. This is a subsection of northwest trending mountains with rounded ridges, steep sides, and narrow canyons. Remnants of marine terraces are present along the coast and nonmarine terraces on the Monterey Peninsula, but they are not extensive. The subsection elevation range is from sea-level up to 5862 feet on Junipero Serra Peak. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly shallow Typic Xerorthents, Entic and Pachic Ultic Haploxerolls, and Pachic Argixerolls. On Cretaceous and Miocene sedimentary rocks they are Lithic Xerorthents and Calcic and Pachic Ultic Haploxerolls. Typic Natrixeralfs and Ultic Palexerolls are present on nonmarine terraces on the Monterey Peninsula. The soils are well drained, and most of them are leached free of carbonates. The soil temperature regimes are mostly thermic, mesic at higher elevation, and some isomesic near the coast. Soil moisture regimes are mostly xeric, and possibly some ustic.

Vegetation. The predominant natural plant communities are Douglas-fir - tanoak series, with some Redwood series in canyons on the southwest side of the subsection; Coast live oak series on north-facing and California sagebrush - black sage series on south-facing slopes near the northwest end of the Santa Lucia Range and inland; Canyon live oak series on steep canyon sideslopes; and Chamise series and Live oak shrublands on shallow soils inland and at higher elevations. There are smaller amounts of Blue oak series adjacent to the Salinas Valley, Valley oak series in Carmel Valley, California sagebrush series and California oatgrass series near the ocean, and



Subsection 261Aj, coastal part — *Robert Ettner* with some Mixed conifer series at higher elevations. Monterey pine series on the Monterey Peninsula and Santa Lucia fir series on the coastal side of the mountain range are not extensive but are of special interest.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, California oatgrass series, Montane meadow habitat, Purple needlegrass series.

Shrublands: Black sage series, Blue blossom series, California sagebrush series, Chamise series, Chamise - bigberry manzanita series, Chamise - black sage series, Chamise - wedgeleaf ceanothus series, Coyote brush series, Deer brush series, Coyote brush - black sage series, Coyote brush - California sagebrush series, Eastwood manzanita series, Holdiscus series, Hoover's manzanita series, Montane wetland shrub habitat, Rubber rabbitbrush series, Scrub oak series, Wartleaf ceanothus series, Wartleaf ceanothus - chamise series, Wedgeleaf ceanothus series, Woollyleaf manzanita series.

Forests and woodlands: Bishop pine series, Black oak series, Blue oak series, California bay series, California buckeye series, California sycamore series, Canyon live oak series, Coast live oak series, Coulter pine series, Coulter pine - canyon live oak series, Douglas-fir - tanoak series, Gowen cypress stands, Interior live oak series, Knobcone pine series, Mixed oak series, Monterey cypress stands, Monterey pine series, Ponderosa pine series, Redwood series, Santa Lucia fir series, Tanoak series, Valley oak series, White alder series.

Climate. The mean annual precipitation is about 16 to 60 inches. It is practically all rain, except for some snow on at higher elevations. Mean annual temperature is about 50° to 58° F. The mean freeze-free period is about 225 to 300 days.

Surface Water. Runoff is rapid and all but the larger streams and streams in the southwest part of the subsection are generally dry during the summer. Streams on the seaward side of the mountains may be perennial. There are no lakes in the subsection.

Subsection 261Ak
South Coastal Santa Lucia Range

This subsection is the southern part of the Santa Lucia Range that is near the coast, between the Nacimiento fault and the Pacific Ocean. The climate is hot and subhumid; it is modified greatly by marine influence. MLRAs 14c, 14d, and 15d.

Lithology and Stratigraphy. This subsection consists of mostly folded, faulted, and generally metamorphosed sedimentary and volcanic rocks of the Franciscan Complex and much less extensive Cretaceous sediments of the great valley sequence. Some ultramafic rock occurs in this subsection. Miocene marine sediments dominate the southeast end of the subsection, from San Luis Obispo to the Santa Maria or Sisquoc River. Late Quaternary alluvium occurs in Los Osos Valley and some Quaternary marine sediments are along the coast.

Geomorphology. This is a subsection of northwest trending mountains and hills with rounded ridges, steep sides, and mostly narrow canyons. Los Osos Valley is a broad one with substantial areas of floodplain, alluvial fans, and terraces. Remnants of marine terraces are present on narrow benches along the coast. Sand dunes are common along the coast, both adjacent to the beach and on marine terraces. The subsection elevation range is from sea-level up to 3408 feet on Pine Mountain and 3744 feet on Alder Peak at the northwest edge of the subsection. Mass wasting and fluvial erosion are the main geomorphic processes. Sedimentation is an important process in Los Osos Valley. Wind is an important geomorphic agent along the coast.

Soils. The soils are mostly Lithic Xerorthents, Lithic and Pachic Ultic Haploxerolls, serpentinitic Lithic Argixerolls, and Chromic Pelloxererts. Most of these soils are present on Miocene rocks, also, plus shallow Pachic Haploxerolls and Calcic Pachic Haploxerolls at the relatively dry southeast end of the subsection. Pachic Haploxerolls and Chromic Pelloxererts are common on alluvium and marine terraces. Typic and Alfic Xeropsamments prevail in eolian sand behind beaches and on some marine terraces. The soils are well drained, and most are leached free of carbonates, except those on Miocene rocks at the southwest end of the subsection. The soil temperature regimes are thermic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Coast live oak series, Chamise series, Manzanita shrublands, and Needlegrass grasslands. Some edaphic associations are Chamise series on shallow soils, Leather oak series on shallow serpentinitic soils, Needlegrass grasslands on Vertisols, and Manzanita shrublands on silicic sandstones. California sagebrush - black sage series is common near the coast and Coast live oak series and Valley oak series are common in Los Osos Valley. The dunes support a succession of plant communities, from bare dune through herbaceous communities and Coyote brush series to California sagebrush - black sage series on stabilized dunes.

Characteristic series by lifeform include:
Dune vegetation: Dune lupine-goldenbrush series, Sand-verbena - beach bursage series, Yellow bush lupine series.

Subsection 261Ak, San Luis Obispo area — *Robert Ettner*

Saltmarsh vegetation: Cordgrass series, Ditchgrass series, Pickleweed series, Saltgrass series, Sedge series.

Grasslands: California annual grassland series, Purple needlegrass series.

Shrublands: Black sage series, Blue blossom series, California encelia series, California sagebrush series, California sagebrush - black sage series, Chamise series, Chamise - bigberry manzanita series, Chamise - black sage series, Chamise - wedgeleaf ceanothus series, Coyote brush series, Deer brush series, Eastwood manzanita series, Leather oak series, Scrub oak series, Wedgeleaf ceanothus series, Woollyleaf manzanita series.

Forests and woodlands: Bishop pine series, California bay series, California sycamore series, Coast live oak series, Knobcone pine series, Mixed oak series, Sargent cypress series, Tanoak series, Valley oak series, White alder series.

Climate. The mean annual precipitation is about 20 to 40 inches. It is practically all rain, except for some snow on at higher elevations. Mean annual temperature is about 50° to 60° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Runoff is rapid and all but the larger streams are generally dry during the summer. Streams on the seaward side of the mountains in the northwestern part of the subsection may be perennial. There are no lakes, other than temporary ponding behind dunes.

Subsection 261Al
Santa Maria Valley

This subsection is on alluvial plains along the Santa Maria River and on the Nipomo Mesa north of the river. It extends from the coast about 30 miles inland. The climate is hot and subhumid; it is modified greatly by marine influence. MLRA 14d.

Lithology and Stratigraphy. This subsection contains mostly Pleistocene nonmarine deposits and recent alluvium. Dune sand is common and there are some areas of Quaternary marine and Plio-Pleistocene nonmarine sediments.

Geomorphology. Most of the alluvial plain is nearly level floodplain and stream terraces. Dunes are fairly extensive behind beaches along the coast and sand has spread across the terraces. A remnant marine terrace is left behind Pismo Beach. The subsection elevation range is from sea-level up to about 800 feet. Fluvial and eolian erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Fluventic and Cumulic Haploxerolls on floodplains and Mollic Haploxeralfs, Pachic Argixerolls, Typic Haploxeralfs, Mollic Palexeralfs, Alfic Xeropsamments, and Haplic Durixeralfs on stream terraces. Typic Xeropsamments, Psammentic Haploxerolls, and Alfic Xeropsamments are the main soils on dunes. Most, but not all, of the soils are leached free of carbonates. Silica has accumulated and cemented the subsoil in some terrace soils. The soils are mostly well drained. The soil temperature regimes are thermic (nearly mesic). Soil moisture regimes are mostly xeric (nearly ustic).

Vegetation. The predominant natural plant communities are Valley oak series along the Santa Maria River and Coast live oak series on the terraces of Nipomo Plain. The dunes support a succession of plant communities, from bare dune through herbaceous communities to California sagebrush series on stabilized dunes.

Characteristic series by lifeform include:

Dune vegetation: Dune lupine - goldenbrush series, Sand-verbena - beach bursage series, Yellow bush lupine series.

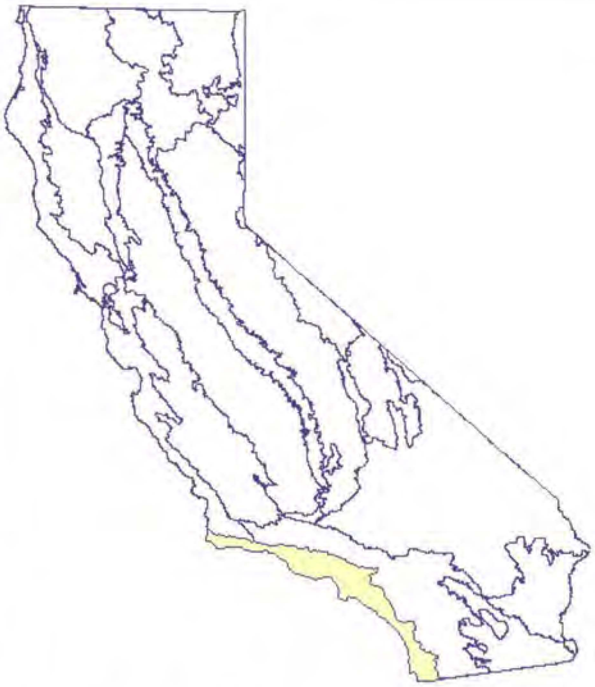
Grasslands: California annual grassland series.

Shrublands: California encelia series, California sagebrush series, Purple sage series.

Forests and woodlands: Coast live oak series, Valley oak series

Climate. The mean annual precipitation is about 12 to 15 inches. It is all rain; summer fog is common. Mean annual temperature is about 56° to 58° F. The mean freeze-free period is about 275 to 300 days.

Surface Water. Runoff is slow across the alluvial plains. There is little overland flow from areas of active and stabilized dunes. Natural lakes are absent, although there is temporary ponding behind sand dunes.



Section 261B
Southern California Coast

This section contains mountains, hills, valleys, and plains of the Transverse Ranges and of the Peninsular Ranges that are close enough to the Pacific Ocean for the climate to be modified greatly by marine influence. It is in MLRAs 19 and 20.

Geomorphology. Narrow ranges and broad fault blocks; alluviated lowlands and coastal terraces. Transverse and Peninsular Ranges geomorphic province.

Lithology. Cenozoic marine and nonmarine sedimentary rocks and alluvial deposits.

Soil Taxa. Alfisols, Entisols, Inceptisols, Mollisols, Ultisols and Vertisols in combination with thermic, isothermic or mesic soil temperature regimes and xeric, ustic or aquic soil moisture regimes.

Vegetation. Predominant potential natural communities include the California sagebrush - California buckwheat series, Mixed chaparral shrublands, Coast live oak series, Chamise series, Valley oak series and mixed sage series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Broom series, California annual grassland series, Eucalyptus series, Giant reed series, Iceplant series, Introduced perennial grassland series, Kentucky bluegrass series, Pampas grass series and Tamarisk series.
>
> *Series that can occur in all subsections, but are not extensive*: Alkali sacaton series, Bulrush series, Bulrush - cattail series, Cattail series, Creeping ryegrass series, Duckweed series, Foothill needlegrass series, Mexican elderberry series, Mosquito fern series, Nodding needlegrass series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Purple needlegrass series. Saltgrass series, Seep weed series, Sedge series and Spikerush series.
>
> *Series restricted to riparian settings*: Arroyo willow series, Black willow series, California sycamore series, Fremont cottonwood series, Mixed willow series, Mulefat series, Narrowleaf willow series, Pacific willow series, Red willow series and White alder series.

Fauna. Mammals include mule deer, coyotes, bobcat, fox, skunk, raccoon, opossum and ground squirrel. Turkey vultures, hawks, jays, quail, owls, herons, egrets, flycatchers, swallows and ravens are common birds. Birds of concern include the brown pelican, lesser tern, osprey, black rail, clapper rail, California gnatcatcher and savannah sparrow. Reptiles and amphibians include the western rattlesnake, common garter snake, alligator lizards and several species of salamanders and frogs. Marine and shore species include sea lions, seals, brown pelicans, gulls, cormorants, terns and various shore birds.

Section 261B, Santa Barbara area from San Marcos Pass — *Robert Ettner*

Elevation. Sea level to 3,000 feet.

Precipitation. 10 to 30 inches.

Temperature. 45° to 65°F. Summer daytime temperatures often modified by morning fog and sea breezes.

Growing Season. 250 to 365 days.

Surface Water Characteristics. Very few perennial streams occur in the area. Perennial and intermittent streams occur in alluvial and weak bedrock channels that flow directly to the Pacific Ocean. High velocity and quantity flows periodically occur in the numerous intermittent drainages.

Disturbance Regimes.
Fire: Historic occurrence has changed from fires of variable frequency, season and intensity to more frequent, larger and more intense fires.
Seismic Activity: Seismically active area with strong shaking and ground rupture.
Air Quality: Some plant and animal species are noticeably affected by air pollution.

Land Use. Composition and successional sequence of some communities (especially grassland communities) has changed because of plant and animal species introduced between the late 1700's and early 1900's related to grazing, agriculture, and urbanization. Most of the area is densely urbanized.

Cultural Ecology. Humans have been utilizing the area for some 8,000 to 10,000 years, and have been an integral part of south coast ecology for 2,000 to 3,000 years, thriving on the diversity of habitats from ocean and estuary to hills and scrublands, and intensively gathering numerous resources. The Spanish first explored the coastal areas in the mid-1500's, however, did not establish permanent settlements until the Mission Period, in the late 1700's, thus introducing agriculture and religious and social changes. Widespread urbanization of the Los Angeles basin began in the late 1800's. Contemporary attitudes and beliefs are varied; lifestyle is urban. The international border and large Hispanic populations contribute to cultural diversity. The economy is varied and urban oriented; shipping, fishing, tourism and recreation are important industries.

Subsections. The Southern California Coast section is divided into 10 subsections.

Subsection 261Ba
Santa Ynez Hills and Valleys

This subsection is in the northwestern part of the Transverse Ranges. It contains hills and dissected plains between Santa Ynez River and Santa Ynez fault on the south, the Santa Maria Valley on the north, and the San Rafael Mountains on the northeast. The climate is hot and subhumid and is modified greatly by marine influence. MLRAs 14d and 15d.

Lithology and Stratigraphy. This subsection contains predominantly Miocene and Pliocene marine and Plio-Pleistocene and Pleistocene nonmarine sedimentary rocks. Some rocks of the Franciscan Complex on the edge of the San Rafael Mountains are in this subsection. There is late Quaternary alluvium along the Santa Ynez River and San Antonio Creek and their tributaries. Dune sand is present along the coast.

Geomorphology. This subsection is on moderately steep to steep hills in Tertiary marine sediments and dissected plains on Pleistocene nonmarine sediments. Late Quaternary fluvial terraces and floodplains are extensive along the Santa Ynez River and are present, but not extensive, along San Antonio Creek and its tributaries. Sand dunes are present all along the coast, both adjacent to the beach and across the edges of plains that are near the coast. The subsection elevation range is from sea-level up to about 2000 feet, or less, in most of the subsection, but up to about 4000 feet on the edge of the San Rafael Mountain. Mass wasting and fluvial erosion are the main geomorphic processes. Fluvial deposition is an important process in the valleys. Wind is an important geomorphic agent along the coast.

Soils. The soils are mostly Typic and Lithic Xerorthents, Lithic and Pachic Ultic Haploxerolls, and Ultic

Subsection 261Ba, Lake Cachuma area from San Marcos Pass (261Ba) — *Robert Ettner*

Palexerolls on Tertiary marine and Plio-Pleistocene nonmarine sedimentary rocks. In Franciscan terrain they are mostly in Lithic subgroups of Xerochrepts, Haploxerolls, and Mollic Haploxeralfs. On Pleistocene nonmarine sediments, over which eolian sand has spread, they are Xeropsamments, Haplic Durixeralfs, and Typic Albaquults. On late Quaternary nonmarine terraces they are Haploxeralfs and Ultic Palexerolls and Palexeralfs. In sand dunes they are Typic and Alfic Xeropsamments and Entic Haploxerolls. Common soils on recent alluvium are Fluventic and Calcic Haploxerolls. The soils are well drained, except for poorly and somewhat poorly drained soils on nearly level Pleistocene nonmarine sediments. Most of them are leached free of carbonates. Soil temperature regimes are mostly thermic. Soil moisture regimes are mostly xeric, and some are aquic.

Vegetation. The predominant natural plant community is Coast live oak series. Blue oak series occurs on Plio-Pleistocene sediments at the east end of the subsection. Valley oak series is common on recent alluvial plains, and Fremont cottonwood series occurs along streams. Chamise series prevails on shallow soils in the eastern part of the subsection. The dunes support a succession of plant communities, from bare dune through herbaceous communities to Coyote brush series and California sagebrush series on stabilized dunes.

Characteristic series by lifeform include:

Dunelands: Sand-verbena - beach bursage series, Dune lupine - goldenbush series.

Grasslands: California annual grassland series.

Shrublands: Bigpod ceanothus series, Bigpod ceanothus - birchleaf mountain-mahogany series, Bigpod ceanothus - hollyleaf redberry series, Black sage series, California buckwheat series, California buckwheat - white sage series, California sagebrush series, California sagebrush - black sage series, California sagebrush series - California buckwheat series, Chamise series, Chamise - black sage series, Coyote brush series, Mixed sage series, Mixed scrub oak series, Purple sage series, Scrub oak series, Scrub oak - chamise series, White sage series, Woollyleaf manzanita series.

Forests and woodlands: Blue oak series, California bay series, Canyon live oak series, Coast live oak series, Valley oak series.

Climate. The mean annual precipitation is about 12 to 18 inches; it is practically all rain. Summer fog is common. Mean annual temperature is about 52° to 60° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Runoff is rapid and all but the larger streams are generally dry during the summer. There are no natural lakes, other than temporary ponding behind dunes.

Subsection 261Bb
Santa Ynez - Sulphur Mountains

This subsection includes, from west to east, the Santa Ynez Mountains, the Ojai Valley, and the Sulphur Mountains. The climate is hot to temperate and subhumid. MLRAs 15d, 19d, and 20d.

Lithology and Stratigraphy. This subsection contains mostly Eocene, Oligocene, Miocene, and Pliocene marine sedimentary rocks, with some Cretaceous marine sedimentary rock. Quaternary alluvium is most extensive in the Ojai Valley and along the coast from Goleta to Carpinteria. There are some small areas of dissected Quaternary marine terraces and dune sand.

Geomorphology. The Santa Ynez Mountains is an east-west trending range of steep mountains with narrow ridges. The Sulphur Mountains trend more toward the west-southwest. They have broader ridges and there are remnants of Quaternary marine terraces on many of them. Floodplains, fluvial terraces, and alluvial fans are most extensive in Ojai Valley. There are small areas of dunes all along the coast. The subsection elevation range is from sea-level up to 4298 feet on Santa Ynez Peak and 4707 feet on Divide Peak. Mass wasting and fluvial erosion are the main geomorphic processes. Coastal marine and eolian processes are important along the coast.

Soils. The soils are mostly Lithic and Typic Xerorthents, Lithic Haploxerolls, and Typic Argixerolls on Cretaceous, Eocene, Oligocene and Miocene sedimentary rocks; and Calcixerollic Xerochrepts, Calcic Pachic Haploxerolls, and shallow Typic Xerorthents on Pliocene

Subsection 261Bb, Santa Barbara area from San Marcos Pass — *Robert Ettner* sedimentary rocks. Dystric Lithic Xerochrepts are common on Eocene sedimentary rocks in cooler areas. Also, there are Chromoxererts, Palexeralfs, and Haploxerolls on hills of mostly Miocene sedimentary rocks just above the alluvial plain from Goleta to Carpinteria. Haploxerolls, Haploxeralfs, Palexeralfs, and Argialbolls are common on Quaternary nonmarine terraces, and Fluventic and Cumulic Haploxerolls on floodplains. Most, but not all, of the soils are leached free of carbonates. The soils are mostly well drained. Soil temperature regimes are mostly thermic, but mesic on north-facing slopes at higher elevation. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Coast live oak series in areas with thermic soil temperature regimes, Big-cone Douglas-fir - canyon live oak series in areas with mesic soil temperature regimes, Chamise series on shallow soils, and Mixed chaparral shrublands. There are smaller areas of Purple sage series, Bigpod ceanothus series, and Mixed scrub oak series. The dunes and adjacent uplands with a cover of eolian sand support a succession of plant communities, from bare dune through herbaceous communities and Coyote bush series to California sagebrush series on stabilized dunes.

Characteristic series by lifeform include:

Dunelands: Sand-verbena - beach bursage series, Dune lupine - goldenbush series.

Grasslands: California annual grassland series, Purple needlegrass series.

Shrublands: Bigberry manzanita series, Bigpod ceanothus series, Bigpod ceanothus - chamise series, Bigpod ceanothus - hollyleaf cherry series, Black sage series, California buckwheat series, California sagebrush series, California sagebrush - black sage series, California sagebrush series - California buckwheat series, California sagebrush - purple sage series, Chaparral yucca - California buckwheat series, Chamise series, Chamise - Bigberry manzanita series, Chamise - black sage series, Chamise - Eastwood manzanita series, Coyote brush series, Greenbark ceanothus series, Mixed sage series, Mixed scrub oak series, Purple sage series, Scrub oak series, Scrub oak - chamise series, White sage series.

Forests and woodlands: Bishop pine series, California bay series, California walnut series, Canyon live oak series, Coast live oak series, Tanoak series.

Climate. The mean annual precipitation is about 18 to 30 inches. It is practically all rain at lower elevations and mostly rain at higher elevations. Mean annual temperature is about 45° to 60° F. The mean freeze-free period is about 250 to 350 days.

Surface Water. Runoff is rapid. All but the larger streams are dry through the summer. Natural lakes are absent.

Subsection 261Bc Northern Channel Islands

Anacapa, Santa Cruz, San Miguel, and Santa Rosa Islands are in this subsection. It has a hot and subhumid climate that is moderated by the ocean. MLRA 20.

Subsection 261Bc, San Miguel Island — *James R. Nelson*

Lithology and Stratigraphy. Miocene basalt, andesite, pyroclastic, and marine sedimentary rocks predominate in this subsection. There are small areas of Eocene sedimentary, Mesozoic granitic, and Pre-Cretaceous metamorphic rocks. Some of the islands have extensive Quaternary marine terraces and eolian sand deposits.

Geomorphology. The northern Channel Islands are on a line with the Santa Monica Mountains, which are oriented east-west. They have steep to very steep mountainous topography with gently sloping plateaus and dissected marine terraces. Eolian sand has accumulated on some of the surfaces, especially on San Miguel Island. The subsection elevation range is from sea-level up to about 2450 feet. Mass wasting, fluvial erosion, wave erosion, and eolian erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Natrustalfs and Psamments. Salts from the ocean accumulate in the soils. The soils are well drained. Soil temperature regimes are mostly isothermic, and some are thermic. Soil moisture regimes are mostly ustic, and some are xeric.

Vegetation. The predominant natural plant communities include Coast live oak series, Needlegrass grasslands, Island oak series, California sagebrush series, Mixed chaparral shrublands, and Coyote brush series. Dunes and adjacent uplands with a cover of eolian sand support a succession of plant communities, from bare dune through Sand-verbena - beach bursage series.

Characteristic series by lifeform include:
Dunelands: Sand-verbena - beach bursage series, Dune lupine - goldenbush series.

Grasslands: California annual grassland series.

Shrublands: Bigpod ceanothus series, Black sage series, California buckwheat series, California sagebrush series, California sagebrush - black sage series, California sagebrush series - California buckwheat series, Chamise series, Chamise - black sage series, Coyote brush series, Mixed sage series, Mixed scrub oak series, Scrub oak series, Scrub oak - chamise series.

Forests and woodlands: Bishop pine series, Coast live oak series, Hollyleaf cherry stands, Island oak series, Catalina ironwood stands, Torrey pine stands.

Climate. The mean annual precipitation is about 12 to 20 inches; it is all rain. Mean annual temperature is about 54° to 60° F, with 5 to 10° F differences between summer and winter means. The mean freeze-free period is 365 days.

Surface Water. Runoff is rapid. There are few streams, especially few in volcanic terrain, and all of them are dry through the summer. Natural lakes are absent.

Subsection 261Bd Oxnard Plain - Santa Paula Valley

This subsection includes valleys of the Santa Clara River and Calleguas Creek (which is an extension of Arroyo Simi that drains Simi Valley) and a plain at the mouths of these streams. The climate is hot and subhumid; it is modified greatly by marine air. MLRA 19d.

Lithology and Stratigraphy. This subsection contains mainly late Quaternary alluvium and lesser amounts of Plio-Pleistocene nonmarine sediments. Dune sand is present along the coast.

Geomorphology. This subsection is mostly on nearly level floodplains and very gently to gently sloping alluvial fans and terraces. There are small areas of dissected Plio-Pleistocene sediments. Dunes are present in a narrow strip adjacent to the coast. The subsection elevation range is from sea-level up to about 800 feet. Fluvial erosion and deposition are the main geomorphic processes. Wind is an important geomorphic agent along the coast, along with coastal marine processes.

Soils. The soils are mostly Fluventic, Cumulic, and Calcic Haploxerolls, and, near the coast, some Aquic Xerofluvents and Fluvaquentic Haploxerolls. Typic Argixerolls, Mollic Haploxeralfs, and Abruptic Durixeralfs are common on alluvial fans and terraces. On dissected Plio-Pleistocene sediments there are shallow Typic Xerorthents, Calcixerollic Xerochrepts, and Calcic Pachic Haploxerolls. Typic Xeropsamments are common on stabilized dunes. The soils are well to somewhat poorly drained. Calcium carbonates accumulate in some of the soils. Soil temperature regimes are thermic; and soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities include California sagebrush series and Purple sage series. There are small areas of Pickleweed series.

Characteristic series by lifeform include:
Saltmarshs: Cordgrass series, Ditch-grass series, Pickleweed series.

Grasslands: California annual grassland series.

Shrublands: Black sage series, California buckwheat series, California sagebrush series, California sagebrush - black sage series, California sagebrush series - California buckwheat series, Coyote brush series, Mixed sage series, Purple sage series.

Forests and woodlands: California sycamore series, Coast live oak series.

Climate. The mean annual precipitation is about 12 to 18 inches; it is practically all rain. Summer fog is common. Mean annual temperature is about 56° to 60° F. The mean freeze-free period is about 300 to 350 days.

Surface Water. The Santa Clara River drains much of the northern part of the Transverse Ranges. It is perennial, but Calleguas Creek, which is the next largest stream that runs through the subsection, is not perennial. There are no lakes or ponds, other than temporary ponding behind dunes.

Subsection 261Be Simi Valley - Santa Susana Mountains

This subsection includes the Santa Susana Mountains, Oak Ridge, Simi Hills, valleys around the Simi Hills, and Conejo Mountain. It is between the Santa Clara River on the north and the Santa Monica Mountains on the south and stretches from the Oxnard Plain on the west to the San Fernando Valley on the east. The climate is hot and subhumid; it modified greatly to moderately by marine air. MLRAs 19d and 20d.

Lithology and Stratigraphy. This subsection contains mostly Tertiary sedimentary rocks and Quaternary alluvium. More specifically, there are Cretaceous, Eocene, Miocene, and Pliocene marine and Oligocene and Plio-Pleistocene nonmarine sedimentary rocks.

Miocene volcanic rocks also occur on and around Conejo Mountain, between the Simi Hills and the Oxnard Plain.

Geomorphology. This is a subsection of steep mountains; moderately steep to steep hills; and nearly level to gently sloping floodplains, terraces, and alluvial fans. The Santa Susana Mountains, Oak Ridge, and Simi Valley are oriented east-west. There are eroded Tertiary sedimentary rocks, or badlands, in both the Santa Susana Mountains and the Simi Hills. The subsection elevation range is about 200 to 3750 feet. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Lithic and shallow Typic Xerorthents; Calcixerollic Xerochrepts; and Lithic, Typic, Pachic, and Calcic Pachic Haploxerolls. Fluventic Haploxerolls are common in recent alluvium. There are Typic Argixerolls, Mollic Haploxeralfs, and Abruptic Durixeralfs on terraces and old alluvial fans. The soils are well drained. Carbonates accumulate in some of the soils. Soil temperature regimes are thermic, and soil moisture regimes are mostly xeric.

Vegetation. The predominant natural plant communities include California sagebrush series, Mixed sage series, Chamise series, Mixed scrub oak series, and Coast live oak series. Valley oak series is common on recent alluvial plains, and there is some Bigcone Douglas-fir - canyon live oak series on north-facing slopes at higher elevations. There are small areas of California walnut series.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Bigpod ceanothus series, Black sage series, California buckwheat series, California buckwheat - white sage series, California sagebrush series, California sagebrush - black sage series, California sagebrush series - California buckwheat series, Chamise series, Chamise - black sage series, Coyote brush series, Mixed sage series, Mixed scrub oak series, Purple sage series, Scrub oak series, Scrub oak - chamise series, White sage series.

Forests and woodlands: California bay series, California sycamore series, California walnut series, Coast live oak series, Bigcone Douglas-fir - canyon live oak series, Valley oak series.

Climate. The mean annual precipitation is about 16 to 20 inches. It is practically all rain. Mean annual temperature is about 52° to 62° F. The mean freeze-free period is about 275 to 325 days.

Surface Water. Runoff is rapid and all streams are generally dry during the summer. There are no natural lakes.

Subsection 261Bf
Santa Monica Mountains

This subsection consists of the Santa Monica Mountains, which are bounded by ocean, plains, and valleys on all but the north side. On the north it is separated from the Simi Hills and the Conejo Mountain by small valleys and low passes. The climate is hot and subhumid; it is modified greatly on the south side to moderately on the north side of the mountains by marine influence. MLRAs 19d and 20d.

Lithology and Stratigraphy. This subsection contains mainly Mesozoic and Tertiary sedimentary rocks and Miocene volcanic rocks. More specifically, there are Triassic, Jurassic, Cretaceous, Eocene, and Miocene marine and Oligocene and Plio-Pleistocene nonmarine sedimentary rocks. The Miocene volcanic rocks are mostly andesite, basalt, and pyroclastic rocks. Marine terraces are narrow and not well represented in the subsection. There is little recent alluvium in the valleys.

Geomorphology. This is a subsection of steep mountains with narrow to broad summits and narrow canyons. The mountains trend east-west. The elevation range is from sea-level up to 3111 feet on Sandstone Peak. There many are other peaks and ridges above 2500. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Lithic Xerorthents; Lithic and Calcixerollic Xerochrepts; Lithic, Pachic, and Calcic Pachic Haploxerolls; Typic Argixerolls; and Ultic Palexerolls. Also, there are Fluventic Haploxerolls in recent alluvium. The soils are well drained. Carbonates accumulate in some of the soils. The soil temperature regimes are thermic. Soil moisture regimes are mostly xeric.

Vegetation. The predominant natural plant communities include California sagebrush - California buckwheat series and Mixed sage series at lower elevations and Chamise series and Mixed chaparral shrublands at higher elevations. There is some Coast live oak series.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Bigpod ceanothus series, Black sage series, California buckwheat series, California buckwheat - white sage series, California encelia series, California sagebrush series, California sagebrush - black sage series, California sagebrush series - California buckwheat series, Chamise series, Chamise - black sage series, Chamise - chaparral whitethorn series Coyote brush series, Coast picklepear series, Mixed sage series, Mixed scrub oak series, Scrub oak series, Scrub oak - birchleaf mountain-mahogany series, Scrub oak - chamise series, Sumac series, White sage series.

Forests and woodlands: California bay series, California sycamore series, California walnut series, Coast live oak series, Valley oak series.

Climate. The mean annual precipitation is about 15 to 25 inches. It is practically all rain. Mean annual temperature is about 54° to 62° F. The mean freeze-free period is about 300 to 350 days.

Surface Water. Runoff is rapid and the streams are generally dry during the summer. There are no natural lakes.

Subsection 261Bg
Los Angeles Plain

This subsection consists of the Los Angeles Plain and the San Fernando Valley and includes the Verdugo Mountains, San Rafael Hills, and Palos Verdes Hills. The Los Angeles Plain, which is the largest part of the subsection is south of the Santa Monica and San Gabriel Mountains and west of the San Jose and the Puente Hills. The climate is hot and subhumid; it is modified by marine influence greatly on the Los Angeles Plain and moderately in the San Fernando Valley. MLRA 19d.

Lithology and Stratigraphy. This subsection contains mainly Quaternary alluvium. The Verdugo Mountains and San Rafael Hills are geologically similar to the San Gabriel Mountains; they are mostly Pre-Cambrian gneiss and Mesozoic granitic rocks. The Palos Verdes Hills are mostly Miocene sedimentary rocks.

Geomorphology. This is a subsection of nearly level floodplains and terraces and very gently to gently sloping alluvial fans. There are small areas of marine terraces, but they are relatively inextensive compared to fluvial terraces. Steep mountains and moderately steep hills are small but important parts of the subsection. Dunes are present along the coast north of the Palos Verdes Hills and sand has spread across Quaternary terraces behind those dunes. The subsection elevation range is from sea-level to about 1000 feet on the Los Angeles Plain, slightly higher in the San Fernando Valley, and up to 3077 feet in the Verdugo Mountains. Fluvial erosion and deposition are the main geomorphic processes. Mass wasting is important in the mountains, and wind is an important geomorphic agent along the coast.

Soils. The soils are mostly Typic Xerorthents and Typic and Mollic Haploxeralfs. Soils in the Verdugo Mountains and San Rafael Hills are shallow Typic Xerorthents, Lithic Haploxerolls, Typic and Calcixerollic Xerochrepts, and Typic Haploxeralfs. Soils on Miocene sedimentary rocks are shallow Typic Xerorthents, Calcic and Pachic Haploxerolls, Typic Argixerolls, and Chromoxererts and Pelloxererts. The soils in dune sand are Typic Xeropsamments. The soils are well drained. Carbonates accumulate in some of the soils. Soil temperature regimes are thermic, and soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are California sagebrush - California buckwheat series and Mixed sage series. Coast live oak series and California walnut series are common, but not extensive. Chamise series and Mixed chaparral shrublands are common in the Verdugo Mountains and San Rafael Hills. California sycamore series occurs in riparian areas and there is some Pickleweed series around San Pedro Bay.

Characteristic series by lifeform include:

Dunelands: Sand-verbena - beach bursage series, Dune lupine-goldenbush series.

Saltmarshs: Cordgrass series, Ditch-grass series, Pickleweed series.

Grasslands: California annual grassland series.

Shrublands: Black sage series, California buckwheat series, California buckwheat - white sage series, California encelia series, California sagebrush series, California sagebrush - black sage series, California sagebrush series - California buckwheat series, Chamise series, Chamise - black sage series, Coast pickle-pear series, Coyote brush series, Mixed sage series, Sumac series, White sage series.

Forests and woodlands: California sycamore series, California walnut series, Coast live oak series.

Climate. The mean annual precipitation is about 12 to 20 inches; it is practically all rain. Summer fog is common. Mean annual temperature is about 58° to 64° F. The mean freeze-free period is about 300 to 350 days.

Surface Water. The Los Angeles River is the largest stream on the Plain. It drains the San Fernando Valley and much of the San Gabriel Mountains. Most of the streams are dry through the summer. There are no lakes or ponds, other than temporary ponding behind dunes.

Subsection 261Bh
Southern Channel Islands

This subsection includes San Clemente, San Nicolas, Santa Barbara, and Santa Catalina Islands. It has a hot and subhumid climate that is moderated by the ocean. MLRA 20.

Lithology and Stratigraphy. This subsection contains mostly Miocene volcanic rocks, Tertiary subvolcanic (hypabyssal) rocks, and, on San Clemente Island, marine sedimentary rocks of the Franciscan Complex. There are minor amounts of Pre-Cretaceous metamorphic and ultramafic rocks on San Clemente Island. San Nicolas Island is mostly Eocene sedimentary rock and a cover of Quaternary deposits.

Geomorphology. The mountains and hills of the southern Channel Islands and their submarine ridges trend northwest, unlike the northern Channel Islands. Santa Catalina Island is mountainous, with steep slopes. The other islands have broad gently sloping main ridges with moderately steep sideslopes, but very steep on the northwest side of San Clemente Island. San Nicolas Island is capped by a Quaternary marine terrace that has had sand blown up the northwest end of the island onto it. Mass wasting, fluvial erosion, wave erosion (coastal marine), and eolian erosion and deposition are the main geomorphic processes.

Soils. The main soils are mostly Typic Chromoxererts and Typic Chromusterts on volcanic rocks; Lithic, and Mollic Haploxeralfs of rocks of the Franciscan formation; Mollic Haploxeralfs, and Typic Natrustalfs on Eocene sedimentary rocks. Salts from the ocean accumulate in the soils, especially on San Nicolas Island. The soils are well drained. The soil temperature regimes are thermic and isothermic. Soil moisture regimes are xeric and ustic.

Vegetation. The predominant natural plant communities include California sagebrush series, Mixed chaparral shrublands, Coast live oak series, and Coast prickly-pear series. Dunes and adjacent uplands with a cover of eolian sand support a succession of plant communities, from bare dune through Sand-verbena - beach bursage series.

Characteristic series by lifeform include:

Dune vegetation: Sand-verbena - beach bursage series.

Grasslands: California annual grassland series.

Shrublands: Bigpod ceanothus series, Black sage series, California sagebrush series, California sagebrush - black sage series, Chamise series, Coast prickly-pear series, Mixed sage series, Scrub oak series, White sage series.

Forests and woodlands: Catalina ironwood stands, Island oak series.

Climate. The mean annual precipitation is about 12 to 15 inches. It is all rain. Mean annual temperature is about 54° to 60° F, with 5 to 10° F differences between summer and winter means. The mean freeze-free period is about 365 days.

Surface Water. Runoff is rapid. There are few streams, especially few in volcanic terrain, and all of them are dry through the summer. Natural lakes are absent.

Subsection 261Bi
Coastal Hills

This subsection consists of foothills along the west side of the Peninsular Ranges from the Santa Ana River southeast to the Mexican border. The climate is hot and subhumid; it is modified greatly by oceanic influence. MLRA 19d.

Lithology and Stratigraphy. This subsection contains mainly Mesozoic granitic and mafic plutonic rocks, Jura-Triassic volcanic rocks, Pre-Cretaceous metamorphic rocks, and Eocene and Oligocene marine and nonmarine and Miocene marine sedimentary rocks. There are many small areas of late Quaternary fluvial deposits.

Subsection 261Bh, San Nicholas Island — *Eric Vinson*

Subsection 261Bi, foreground near Fallbrook, M262Bn background —*James R. Nelson*

Geomorphology. This is a subsection of moderately steep to steep hills between the mountains of the Santa Ana and Laguna Mountains of the northwest trending Peninsular Ranges and coastal terraces along the southwest edge of the subsection. Many streams crossing from the mountain to the coast have alluvial plains hundreds of yards wide, and there is a broad valley at El Cajon. The subsection elevation range is about 500 to 2000 feet. Mass wasting and fluvial erosion are the main geomorphic processes. Fluvial deposition is an important process on floodplain and alluvial fans in the valleys.

Soils. The soils are mostly Lithic Xerorthents; Lithic, Pachic, and Calcic Haploxerolls; Typic Argixerolls; Typic Natrixeralfs; Natric Palexeralfs; and Chromoxererts and Pelloxererts. On granitic rocks, the soils are mostly shallow Typic Xerorthents and Typic Haploxeralfs. On mafic plutonic rocks, they are mostly Mollic and Typic Haploxeralfs and Typic Rhodoxeralfs. Common soils on floodplains, terraces, and alluvial fans are Typic Xeropsamments, Cumulic Haploxerolls, and Typic Haploxeralfs. The soils are well drained. Calcium carbonates accumulate in many of the soils. The soil temperature regimes are thermic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are California sagebrush - California buckwheat series, and California sagebrush - black sage series, Coast live oak series; and there is some Chamise series, White sage series, Scrub oak series. California sycamore series occurs in riparian areas.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Black sage series, California buckwheat series, California buckwheat - white sage series, California sagebrush series, California sagebrush - black sage series, California sagebrush series - California buckwheat series, Chamise series, Chamise - black sage series, Chamise-mission-manzanita - woollyleaf ceanothus series, Coast prickly - pear series, Mixed sage series, Mixed scrub oak series, Scrub oak series, Scrub oak - chamise series, Sumac series, White sage series.

Forests and woodlands: California sycamore series, Coast live oak series, Engelmann oak series.

Climate. The mean annual precipitation is about 12 to 16 inches; It is practically all rain. Summer fog is common. Mean annual temperature is about 56° to 62° F. The mean freeze-free period is about 275 to 350 days.

Surface Water. Runoff is rapid. Many streams that drain from the mountains across this subsection are perennial, but most of the lateral streams are dry though the summer. There are no lakes, but some reservoirs in the subsection.

Subsection 261Bj Coastal Terraces

This subsection consists of dissected marine terraces along the coast from Newport Beach, at the mouth of the Santa Ana River, southeast to the Mexican border. The climate is hot and subhumid; it is modified greatly by oceanic influence. MLRA 19e.

Lithology and Stratigraphy. This subsection contains mainly Tertiary sedimentary rocks and Quaternary marine sediments. The Tertiary rocks are Eocene marine and nonmarine and Miocene and Pliocene marine sedimentary rocks. There are many small areas of late Quaternary fluvial deposits.

Geomorphology. This is a subsection of nearly level to very gently sloping marine terraces that have been eroded and dissected to expose Tertiary sedimentary rocks. The dissected terrace edges are moderately steep to steep. There is a narrow strip of beach and dune sand along the coast. Some streams have deposited recent alluvium in ponds behind sand bars. The subsection elevation range is from sea-level to about 1500 feet. Mass wasting, coastal marine, and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Alfic Xeropsamments, Typic Natrixeralfs, and Abruptic Durixeralfs on the marine terraces and Lithic Xerorthents, Lithic and Calcic Pachic Haploxerolls, Typic Argixerolls, Typic Haploxeralfs, Typic Natrixeralfs, Natric Palexeralfs, and Chromic Pelloxererts off the terraces, on Tertiary sedimentary rocks. Soils on the oldest terrace surfaces are mostly Abruptic Durixeralfs and Ultic Palexeralfs. Psamments and Cumulic Haploxerolls are common in recent alluvium. Calcium carbonates have accumulated in many of the soils. Soil temperature regimes are thermic, and soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are California sagebrush - California buckwheat series and California sagebrush - black sage series. Chamise series is common and Coast live oak series occurs in some ravines. Pickleweed series occurs in some estuaries. Torrey pine stands and San Diego mesa vernal pools in the southern part of the subsection are unique.

Characteristic series by lifeform include:

Vernal pools: San Diego mesa vernal pools.

Dunelands: Sand-verbena - beach bursage series, Dune lupine - goldenbush series.

Saltmarshs: Cordgrass series, Ditch-grass series, Pickleweed series

Grasslands: California annual grassland series.

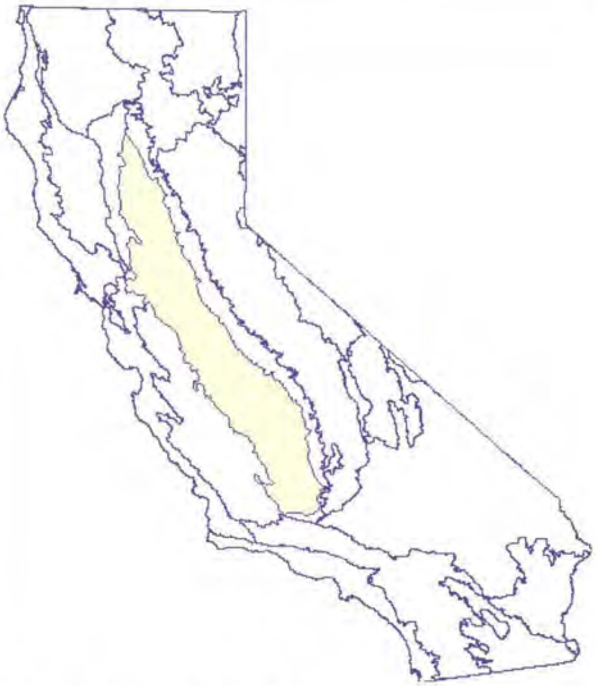
Shrublands: Black sage series, California buckwheat series, California buckwheat - white sage series, California encelia series, California sagebrush series, California sagebrush - black sage series, California sagebrush series - California buckwheat series, Chamise series, Chamise - black sage series, Chamise - mission-manzanita - woollyleaf ceanothus series, Coast prickly-pear series, Mixed sage series, Mixed scrub oak series, Scrub oak series, Scrub oak - chamise series, Sumac series, White sage series.

Forests and woodlands: California sycamore series, Coast live oak series, Engelmann oak series, Torrey pine stands.

Climate. The mean annual precipitation is about 10 to 12 inches; it is all rain. Summer fog is common. Mean annual temperature is about 58° to 62° F. The mean freeze-free period is about 350 to 365 days.

Surface Water. Runoff is rapid, except from undissected terrace surfaces which have vernal pools on them. Many streams that drain from the mountains across this subsection are perennial, but most of the lateral streams are dry though the summer. There are no lakes, other than temporary ponding behind sand bars.

CHAPTER 3



Section 262A Great Valley

This section contains the alluvial plains of the Sacramento and San Joaquin Valleys. Summers are hot and dry and winters are mild. Oceanic influence on climate is slight in the middle of the Great Valley, which receives some marine air through the Carquinez Straits, but becomes negligible at the north and south ends of the Valley. MLRAs 15 and 17.

Geomorphology. Low fluviatile plain. Great Valley geomorphic province.

Lithology. Cenozoic nonmarine sedimentary rocks and alluvial deposits.

Soil Taxa. Alfisols, Aridisols, Entisols, Histisols, Inceptisols, Mollisols and Vertisols in combination with a thermic soil temperature regime and xeric, aquic or aridic soil moisture regimes.

Vegetation. Predominant potential natural communities include Purple needlegrass series, Valley oak series, vernal pools and wetland communities, blue oak series, allscale series and saltgrass series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

Series dominated by exotic plants: California annual grassland series, Cheatgrass series, Common reed series, Eucalyptus series, Introduced perennial grassland series, Kentucky bluegrass series and Tamarisk series.

Series that can occur in all subsections, but are not extensive: Bulrush series, Bulrush - cattail series, Cattail series, Duckweed series, Mexican elderberry series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Saltgrass series, Sedge series and Spikerush series.

Series restricted to riparian settings: Arroyo willow series, Black willow series, Buttonbush series, California sycamore series, Fremont cottonwood series, Mixed willow series, Mulefat series, Narrowleaf willow series, Pacific willow series, Red willow series and White alder series.

Fauna. Former inhabitants include grizzly bear, wolf, tule elk, and pronghorn antelope. Much of the natural habitat has been modified throughout the section. The section contains wetlands that are important feeding and resting areas for migrating waterfowl. Many waterfowl species are year around residents. Mammals include mule deer, black-tailed deer, coyotes, muskrats, beavers, ground squirrels, cottontails, jack rabbits, kangaroo rats and the endangered kit fox. Common birds include hawks, golden eagle, owls, white-tailed kite, quail, mourning dove, mockingbird, scrub jay, gulls, herons, crows, western meadow lark, finches, sparrows, roadrunners (southern part) and the introduced Chinese ringneck pheasant. Tule elk herds have been reestablished in some southern parts of the section.

Section 262A, San Joaquin Valley, Tulare County — *Robert Ettner*

Elevation. Sea Level to 2000 feet.

Precipitation. 5 to 25 inches.

Temperature. 56° to 62°F.

Growing Season. 250 to 300 days.

Surface Water Characteristics. Many slow moving rivers flow to the delta east of San Francisco Bay via the Sacramento and San Joaquin River systems. Flows to these levied, alluvial channel river systems is regulated throughout the year by the many dams occurring in adjacent sections. Constructed deep water ship channels also connect San Francisco Bay to Sacramento and Stockton. Many rivers and perennial streams flow west from the Sierra Nevada foothill section to the Sacramento and San Joaquin Rivers. The many alluvial channels that flow eastward from the Coast Ranges to the Sacramento and San Joaquin Rivers are mostly dry during summer months, only a few are perennial streams. The southern part of the San Joaquin Valley drains to basins and does not reach the San Joaquin River.

Disturbance Regimes.
Fire: Historic occurrence has changed from frequent, fast moving large fires to infrequent small fires, or fire has been mostly excluded because of conversion to irrigated agriculture and urban uses.
Flooding: Although mostly controlled by levee systems, seasonal flooding was extensive in this section

Land Use. Composition and successional sequence of some communities (especially grassland communities) has changed because of plant and animal species introduced between the early 1800's and early 1900's related to grazing, agriculture, and urbanization. Most of the section is converted to irrigated agriculture. Rapidly expanding urbanized areas are scattered throughout the section. Flood control has decreased the duration and extent of wetlands.

Cultural Ecology. Humans have been utilizing the central valley for 10,000 years, and have been an integral part of its ecology for 3,000 to 5,000 years. The valley contains some of the densest year-round prehistoric habitation locations in California, particularly along riparian areas, where intensive occupation, resource procurement and processing practices, and vegetation manipulation through the use of fire sometimes altered the environment. Around the time of the Gold Rush, Euroamericans flooded into the valley, converting the land to agriculture, which became the mainstay of California economy. The river systems provided early transportation routes. Sacramento and Stockton are shipping ports served by deep water channels. Contemporary attitudes and beliefs are varied; lifestyles are both urban and rural; economies are dominated by agriculture, government, and services; populations are diverse.

Subsections. The Great Valley section is divided into 26 subsections.

Subsection 262Aa North Valley Alluvium

This subsection consists of the northern part of the recent alluvial plain in the Sacramento Valley. The climate is hot and subhumid. MLRA 17d.

Lithology and Stratigraphy. This subsection contains Pleistocene and recent alluvium. The alluvium is from granitic, volcanic, sedimentary, and metamorphic rock sources.

Geomorphology. This subsection is mainly floodplains and very gently sloping recent alluvial fans. There are some Pleistocene terraces west of the Sacramento River that are in northern part this subsection. The subsection elevation range is from 150 to about 300 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic, Aquic, and Mollic Xerofluvents and Cumulic Haploxerolls on floodplains and Argixerolls, Haploxeralfs, and Palexeralfs on late Quaternary alluvial fans. On Pleistocene terraces they are mostly Abruptic Durixeralfs and Typic Palexeralfs. The soils are mostly well drained, but some on floodplains are somewhat poorly drained to moderately well drained soils. Most of them are leached free of carbonates. The soil temperature regimes are thermic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Needlegrass grasslands. Fremont cottonwood

Subsection 262Aa, looking northeast toward Hamilton City — *Robert Ettner* series occurs along streams, and Valley oak series is common on recent alluvial plains. There are some Northern claypan vernal pools on Pleistocene terraces.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.
Vernal pools: Northern hardpan vernal pools.
Forests and woodlands: Blue oak series, California sycamore series, Fremont cottonwood series, Foothill pine series, Valley oak series.

Climate. The mean annual precipitation is about 16 to 24 inches. It is practically all rain. Mean annual temperature is about 59° to 60° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Streams in this subsection drain to the Sacramento River, which runs through the subsection. All but the larger streams are generally dry during the summer. There are no lakes, but there is temporary ponding in vernal pools on Pleistocene terraces.

Subsection 262Ab
Northern Eastside Terraces

This subsection is on terraces along the eastern edge of the Sacramento Valley that are adjacent to the Southern Cascade Ranges. It is hot and subhumid. MLRA 17d.

Lithology and Stratigraphy. This subsection contains Pleistocene and recent alluvium from volcanic rock sources.

Geomorphology. This subsection is on very gently sloping to sloping terraces and small areas of floodplain and alluvial fans along streams that cross from mountains of the Southern Cascade Ranges to reach the Sacramento River. The subsection elevation range is from 200 to about 600 feet. Fluvial erosion is the main geomorphic process.

Soils. The soils are mostly Typic Durixeralfs and Mollic Haploxeralfs. The soils are well drained. Bicarbonate weathering and leaching and accumulation of clay and silica in subsoils are the main pedogenic processes in the terrace soils. The soil temperature regimes are thermic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Needlegrass grasslands, and Northern claypan vernal pools are common.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.
Vernal pools: Northern volcanic mudflow vernal pools.
Forests and woodlands: California sycamore series.

Climate. The mean annual precipitation is about 18 to 25 inches. It is practically all rain. Mean annual temperature is about 58° to 60° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Streams in this subsection drain to the Sacramento River. All but the larger streams are generally dry during the summer. There are no lakes, but there is temporary ponding in vernal pools on Pleistocene terraces.

Subsection 262Ab, near Chico —*James R. Nelson*

Subsection 262Ac
Butte Sink - Sutter Basin

This subsection is on the alluvial plain between the Feather and the Sacramento Rivers. It has a hot and subhumid climate. MLRAs 17d and 17e.

Lithology and Stratigraphy. This subsection contains recent alluvium. The alluvium is from granitic, volcanic, sedimentary, and metamorphic rock sources, but from mostly volcanic rocks at the northern end of the subsection. Extensive areas are underlain by siltstone.

Geomorphology. This subsection is on very gently sloping to nearly level alluvial fans, floodplains, and basin floors. The subsection elevation range is from about 30 to about 150 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Pelloxererts. Also, Typic and Aquic Chromoxererts, Aquic Haploxerolls, Typic Argixerolls and soils with duripans are common. The soils are mostly moderately well to poorly drained. Soil temperature regimes are thermic, and soil moisture regimes are xeric and aquic. Some poorly drained soils have been artificially drained.

Vegetation. The predominant natural plant communities are Needlegrass

Subsection 262Ac, Butte sink area — *James R. Nelson*

grasslands. Fremont cottonwood series occurs along streams. Emergent aquatic communities are common in low areas.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.
Vernal pools: Northern hardpan vernal pools.
Wetlands: Bulrush series, Bulrush - cattail series, Cattail series, Sedge series.
Forests and woodlands: Fremont cottonwood series, Mixed willow series.

Climate. The mean annual precipitation is about 15 to 20 inches; it is practically all rain. Mean annual temperature is about 60° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. The larger part of the subsection, which is north of the Sutter Buttes, is drained by Butte Creek. Butte creek runs parallel to the Feather River on the east and the Sacramento River on the west. Much of the area that was naturally flooded in winter and spring is now protected by artificial levees. There are no lakes, but winter ponding occurs.

Subsection 262Ad
Colusa Basin

This subsection is on the overflow plain of the Sacramento River. It is between the levee of the Sacramento River and alluvial fans from the northern California Coast Ranges. The climate is hot and subhumid. MLRA 17e.

Lithology and Stratigraphy. This subsection contains recent alluvium. The alluvium is from granitic, volcanic, sedimentary, and metamorphic rock sources, but it is mostly from sedimentary and metamorphic rock sources along the western edge of the subsection.

Geomorphology. This subsection is on a nearly level basin floor, with some alluvial fans along the western edge of the subsection. The subsection elevation range is from about 20 to about 120 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Haploxererts, Xeric and Sodic Endoaquerts, and Cumulic Vertic Endoaquolls. They are mostly moderately well to poorly drained. Soil temperature regimes are thermic, and soil moisture regimes are xeric and aquic.

Vegetation. The predominant natural plant communities is Needlegrass grasslands. Fremont cottonwood series occurs along streams. Emergent aquatic communities are common.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.
Wetlands: Bulrush series, Bulrush - cattail series, Cattail series, Sedge series.
Forests and woodlands: Fremont cottonwood series, Mixed willow series.

Climate. The mean annual precipitation is about 14 to 18 inches; it is practically all rain. Mean annual temperature is about 60° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. The Sacramento River overflowed onto this area when it flooded before being controlled by dams, artificial levees, and diversions. Streams draining eastward from the northern California Coast Ranges are diverted southward in overflow channels that run parallel to the Sacramento River. Most of the streams are generally dry during the summer. There are no lakes, but winter ponding occurs..

Subsection 262Ae
Sutter Buttes

This subsection consists of a circular area of volcanic hills surrounded by the alluvial plain of the Sacramento River valley. The climate is hot and subhumid. MLRA 18d.

Lithology and Stratigraphy. The rocks of this subsection are mostly pyroclastic, and some silicic to intermediate flows.

Geomorphology. This subsection is a circular area of steep to moderately steep hills with several peaks near the center. It has a radial drainage pattern. The subsection elevation range is from about 50 to 2117 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Subsection 262Ae, Sutter Buttes — *James R. Nelson*

Soils. The soils are mostly Mollic and Lithic Mollic Haploxeralfs, Lithic Xerorthents, Typic Argixerolls, and Typic Chromoxererts. The soils are well drained. Most of the soils are leached free of carbonates. Soil temperature regimes are thermic, and soil moisture regimes are xeric.

Vegetation. The most extensive natural plant communities are Blue oak series, and, on south-facing slopes and summits, Needlegrass grasslands.

> **Characteristic series by lifeform include:**
> *Grasslands*: California annual grassland series, Purple needlegrass series.
> *Forests and woodlands*: Blue oak series.

Climate. Mean annual precipitation is about 15 to 18 inches. It is practically all rain. Mean annual temperature is about 58° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Most of the streams are dry through the summer. There are no lakes.

Subsection 262Af River Alluvium

This subsection is an alluvial plain and natural levees adjacent to the Sacramento and Feather Rivers. The climate is hot and subhumid. MLRA 17e.

Lithology and Stratigraphy. This subsection contains recent alluvium. The alluvium is from granitic, volcanic, sedimentary, and metamorphic rock sources.

Geomorphology. This subsection is on nearly level floodplains and very gently sloping levees. The natural levees have been almost completely obliterated by construction of artificial levees on them. The subsection elevation range is about 25 to 150 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Aquic and Mollic Xerofluvents and Fluventic and Cumulic Haploxerolls on frequently flooded plains and Typic and Pachic Haploxerolls and Mollic Haploxeralfs on levees and infrequently flooded plains. The soils are mostly moderately well to somewhat poorly drained; there are minor amounts of poorly drained soils. Soil temperature regimes are thermic, and soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Fremont cottonwood series and Emergent aquatic communities along streams and Needlegrass grasslands on levees and floodplains.

> **Characteristic series by lifeform include:**
> *Grasslands*: California annual grassland series, Purple needlegrass series.
> *Wetlands*: Bulrush series, Bulrush - cattail series, Cattail series, Sedge series.
> *Forests and woodlands*: Fremont cottonwood series, Mixed willow series.

Climate. The mean annual precipitation is about 15 to 18 inches. It is practically all rain. Mean annual temperature is about 60° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. The Sacramento and Feather Rivers are large perennial streams that flooded large areas annually before their flows were artificially controlled. There are no lakes in the subsection.

Subsection 262Ag Hardpan Terraces

This subsection is on terraces along the eastern edge of the Sacramento and San Joaquin Valleys. The climate is hot and semi-arid to subhumid. MLRAs 17d and 17f.

Lithology and Stratigraphy. This subsection contains mostly Pleistocene alluvium, but some is older. In the northern part of the subsection, the alluvium is from volcanic, granitic, sedimentary, and metamorphic rock sources. The proportion of alluvium from granitic rock sources increases southward.

Geomorphology. This subsection consists of very gently to gently sloping terraces and small areas of floodplain and alluvial fans along streams that cross from mountains to reach the Sacramento and San Joaquin Rivers. The subsection elevation range is from 100 to about 400 feet. Fluvial erosion is the main geomorphic processes.

Soils. The soils are mostly Typic and Abruptic Durixeralfs and Typic, Mollic, and Ultic Palexeralfs. In relatively dry areas near the southern end of the San

Subsection 262Ag near Porterville — *Kerry Arroues*

Joaquin Valley there are Xeric Torriorthents, Calcixerollic Xerochrepts, and Xeralfic Haplargids. The soils are well drained. Bicarbonate weathering and leaching and accumulation of clay and silica in subsoils are the main pedogenic processes in the terrace soils. Calcium carbonates accumulate in some of the drier soils. The soil temperature regimes are thermic. Soil moisture regimes are mostly xeric, but aridic at the southern end of the subsection.

Vegetation. The predominant natural plant communities are Needlegrass grasslands, and Northern hardpan vernal pools are common.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Purple needlegrass series.

Vernal pools: Northern hardpan vernal pools.

Shrublands: Cupleaf ceanothus - fremontia - oak series.

Forests and woodlands: Blue oak series, California sycamore series, Foothill pine series.

Climate. The mean annual precipitation is about 10 to 25 inches. It is practically all rain. Precipitation increases both toward the Sierra Nevada and toward the northern end of the Great Valley. Mean annual temperature is about 58° to 62° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Streams in this subsection drain to the Sacramento or San Joaquin Rivers or to closed basins in the San Joaquin Valley. All but the larger streams are generally dry during the summer. There are no lakes, but there is temporary ponding in vernal pools on Pleistocene terraces.

Subsection 262Ah Yolo Alluvial Fans

This subsection is on a late Quaternary alluvial plain on the lower west side of Sacramento Valley. The climate is hot and subhumid. MLRA 17e.

Lithology and Stratigraphy. This subsection contains Pleistocene and recent alluvium. The alluvium is from granitic, volcanic, sedimentary, and metamorphic rock sources.

Geomorphology. This subsection is mainly late Pleistocene and recent alluvial fans from the northern California Coast Ranges and from hills on the lower west side of the Sacramento River. The subsection elevation range is from about 20 to about 200 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Xerofluvents, Typic Xerochrepts, and Typic and Mollic Haploxeralfs. Typic

Subsection 262Ah north of Woodland (foreground), M261Cc (mid) and M261Ca (background), — *Kerry Arroues*

Pelloxererts are common in finer sediments, Aquic Haploxeralfs in low areas, and Typic Palexeralfs on older surfaces. The soils are mostly well drained, but some on floodplains are somewhat poorly drained. Most of them are leached free of carbonates. Soil temperature regimes are thermic, and soil moisture regimes are mostly xeric.

Vegetation. The predominant natural plant communities are Needlegrass grasslands, and Valley oak series is common on recent alluvial plains. Fremont cottonwood series occurs along streams, particularly along Cache Creek and Putah Creek.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.
Forests and woodlands: Fremont cottonwood series, Mixed willow series, Valley oak series.

Climate. The mean annual precipitation is about 15 to 18 inches. It is practically all rain. Mean annual temperature is about 59° to 60° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Streams in this subsection drain to the Sacramento River. All but the larger streams are generally dry during the summer. There are no lakes.

Subsection 262Ai
Yolo - American Basins

This subsection is on an alluvial plain adjacent to the lower Sacramento River. Much of it is flooded during the winter or early spring. The climate is hot and subhumid. MLRAs 16e and 17e.

Lithology and Stratigraphy. This subsection contains recent alluvium of stream channel, stream overflow, and alluvial fan deposits. The alluvium is from granitic, volcanic, sedimentary, and metamorphic rock sources in mountains around the Sacramento Valley.

Geomorphology. This subsection is on nearly level to very gently sloping stream channels, levees, overflow basins, and alluvial fans. The subsection elevation range is from about 10 to about 40 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Aquic Xerofluvents; Aeric Haplaquepts; and Cumulic and Vertic Haplaquolls. Pelloxererts and Chromoxererts are common on alluvial fans. The soils are moderately well drained to poorly drained. Soil temperature regimes are thermic, and soil moisture regimes are aquic and xeric.

Vegetation. The predominant natural plant communities are Emergent aquatic communities and Needlegrass grasslands.

Characteristic series by lifeform include:
Wetlands: Bulrush series, Bulrush - cattail series, Cattail series, Sedge series.
Forests and woodlands: California sycamore series, Fremont cottonwood series, Mixed willow series.

Climate. The mean annual precipitation is about 14 to 18 inches. It is practically all rain. Mean annual temperature is about 60° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. The Sacramento River overflows onto parts of this area and overflowed onto most of the area when it flooded before being controlled by dams, artificial levees, and diversions. Streams drain toward the Sacramento River on alluvial fans and parallel to it in overflow basins. All but the larger streams are generally dry during the summer. There are no lakes, but there is temporary ponding in overflow basins.

Subsection 262Aj
Sodic Claypan Terraces

This subsection is on a late Quaternary alluvial plain on the lower west side of Sacramento Valley. The climate is hot and subhumid. MLRA 17e.

Lithology and Stratigraphy. This subsection contains late Quaternary alluvium from volcanic, sedimentary, and metamorphic rock sources.

Geomorphology. This subsection is mainly nearly level to gently sloping late Pleistocene and recent alluvial fans from the southern end of the northern California Coast Ranges. The subsection elevation range is from about 20 to about 120 feet. Fluvial erosion and deposition are the main geomorphic processes.

Subsection 262Aj, Jepson Prairie area southeast of Vacaville — *Glen Stanisewski*

Soils. The soils are mostly Typic Palexeralfs, Typic and Aquic Natrixeralfs, Pelloxererts and Chromoxererts, and some Typic, Aquic, and Mollic Haploxeralfs. Xerorthents, Xerochrepts, and Aeric Haplaquepts on recent alluvium. The soils are mostly moderately well and somewhat poorly drained, with some well and poorly drained. Sodium accumulates in some soils with claypans. Soil temperature regimes are thermic, and soil moisture regimes are mostly xeric and some aquic.

Vegetation. The predominant natural plant communities are Needlegrass grasslands, and Northern claypan vernal pools are common.

> **Characteristic series by lifeform include:**
> *Grasslands*: California annual grassland series, Purple needlegrass series.
>
> *Vernal pools*: Northern claypan vernal pools.

Climate. The mean annual precipitation is about 16 to 20 inches. It is practically all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Streams in this subsection drain to the Sacramento River. All but the larger streams are generally dry during the summer. There are no lakes, but there is temporary ponding in vernal pools on the older alluvial fans.

Subsection 262Ak
Montezuma Hills

This is a subsection of rolling hills mostly bordered by alluvial plains of the Great Valley and by the Suisun Bay to the south. The climate is hot and subhumid. MLRA 15e.

Lithology and Stratigraphy. This subsection contains Quaternary nonmarine sediments.

Geomorphology. This subsection is on gently sloping to moderately steep hills. The subsection elevation range is from less than 10 to 268 feet. Fluvial erosion is the main geomorphic process.

Soils. The soils are mostly Entic and Typic Chromoxererts and Calcixerollic Xerochrepts. They are well drained. Soil temperature regimes are thermic and soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Needlegrass grasslands.

> **Characteristic series by lifeform include:**
> *Grasslands*: California annual grassland series, Purple needlegrass series.

Climate. The mean annual precipitation is about 16 to 20 inches. It is practically all rain. Mean annual temperature is about 58° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. There are no large streams in this subsection. The drainage pattern is radial. Most of the streams are dry during the summer. There are no lakes.

Subsection 262Al
Delta

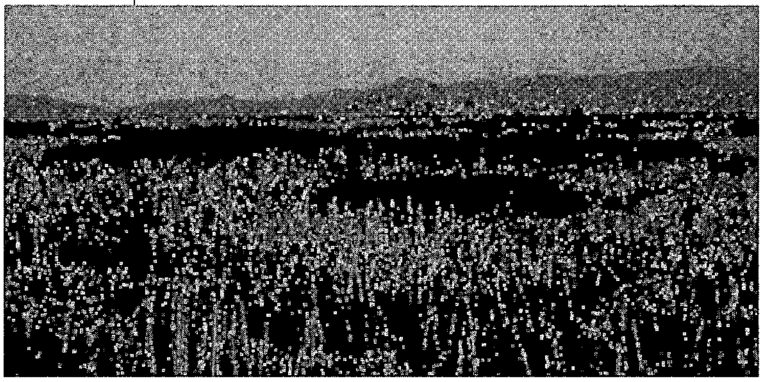
This subsection in a low area, near sea-level, at the confluence of the Sacramento and San Joaquin Rivers. Organic fill is a distinctive feature of the subsection. The climate is hot and subhumid. MLRA 16e.

Lithology and Stratigraphy. This subsection contains Quaternary sediments covered by organic deposits.

Geomorphology. This subsection is a practically level plain, except for the levees of the Sacramento and San Joaquin Rivers. Many artificial levees have been constructed to prevent flooding of land committed to agriculture. The subsection elevation range is from a few feet on levees of the Sacramento and San Joaquin Rivers to sea-level, or lower, on the rest of the plain. Decomposition of the organic deposits and consequential land subsidence is the main geomorphic process. Fluvial erosion and deposition are the main geomorphic processes on and adjacent to levees.

Soils. The soils are mostly Typic and Terric Medisaprists and Cumulic Haplaquolls. Fluvaquentic Haploxerolls, Fluvaquents, Haplaquepts, and Medihemists are common. Most of the soils are poorly to very poorly drained. Soil temperature regimes are thermic (nearly mesic). Soil moisture regimes are mostly aquic, but they are xeric on levees.

Vegetation. The predominant natural plant communities are Emergent aquatic communities, such as the Bullrush - cattail series.



Subsection 262Al, Grizzly Island area — *Glen Stanisewski*

Characteristic series by lifeform include:
Grasslands: California annual grassland series.
Wetlands: Bulrush series, Bulrush - cattail series, Cattail series, Ditch-grass series, Sedge series.

Climate. Mean annual precipitation is about 14 to 16 inches. It is practically all rain. Mean annual temperature is about 56° to 60° F. Summer temperatures are moderated by marine air. The mean freeze-free period is about 250 to 275 days.

Surface Water. The Sacramento and San Joaquin Rivers follow meanders, that are somewhat modified artificially, across the subsection. There are many overflow channels. Brackish tidal water enters the area when river flow is low during the summer and autumn.

Subsection 262Am Delta Basins

This subsection is in a low area of inorganic sediments along the eastern edge of the delta area of the Sacramento and San Joaquin Rivers. The climate is hot and subhumid. MLRA 17e.

Lithology and Stratigraphy. This subsection contains late Quaternary alluvium. Most of the alluvium is from granitic rock sources, but some is from volcanic, sedimentary, and metamorphic rock sources.

Geomorphology. This subsection is a nearly level plain. It is the deltas of the Cosumnes, Mokelumne, and Calaveras Rivers and basin floor with basin-fill from the overflow of these and the Sacramento and San Joaquin Rivers. The subsection elevation range is from sea-level to about 50 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Aquic Xerofluvents; Pelloxererts; Cumulic and Duric Haplaquolls; Argic Durixerolls; Typic Durixerolls; and Chromoxererts. The soils are mostly somewhat poorly to poorly drained, and some are moderately well drained. Soil temperature regimes are thermic, and soil moisture regimes are mostly aquic and xeric.

Vegetation. The predominant natural plant communities are Needlegrass grasslands, Emergent aquatic communities in low areas along the edge to the delta, and Fremont cottonwood series along streams.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.
Wetlands: Bulrush series, Bulrush - cattail series, Cattail series, Ditch-grass series, Sedge series.
Forests and woodlands: Fremont cottonwood series, Mixed willow series.

Climate. The mean annual precipitation is about 16 to 18 inches. It is practically all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Streams in this subsection drain to the delta area of the Sacramento and San Joaquin Rivers. All but the larger streams are generally dry during the summer. There are no lakes.

Subsection 262An Winters Terraces

This subsection is on terraces with clayey soils along the western edge of the lower Sacramento Valley, adjacent to the northern California Coast Ranges. The climate is hot and subhumid. MLRA 15d.

Lithology and Stratigraphy. This subsection contains predominantly Pliocene nonmarine sediments that are only slightly consolidated. There are smaller areas of Quaternary terraces and recent alluvium.

Geomorphology. This subsection is on very gently sloping terraces that are dissected and eroded to form gently sloping to moderately steep slopes. There are small areas of recent floodplain and terraces along streams that cross from mountains of the northern California Coast Ranges to reach the Sacramento River. The subsection elevation range is from about 100 to about 200 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Palexeralfs, Typic Haploxeralfs, Entic and Typic Chromoxererts, and Typic Argixerolls. Soils on recent alluvium are Typic Xerorthents, Typic Xerochrepts, Aeric Haplaquepts, and Haploxeralfs. Most of the soils are well drained, but some in recent alluvium are somewhat poorly drained. Bicarbonate weathering and leaching and accumulation of clay in subsoils are the main pedogenic processes in the terrace soils. Soil temperature regimes are thermic. Soil moisture regimes are mostly xeric, with some aquic on floodplains.

Vegetation. The predominant natural plant communities are Needlegrass grasslands and Blue oak series. Fremont cottonwood series occurs along streams.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Needlegrass series.
Vernal pools: Northern hardpan vernal pools.
Forests and woodlands: Blue oak series, Fremont cottonwood series.

Climate. The mean annual precipitation is about 20 to 25 inches. It is practically all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Streams in this subsection drain to the Sacramento River. All but the larger streams are generally dry during the summer. There are no lakes, but there is temporary ponding in vernal pools on Pleistocene terraces.

Subsection 262Ao Camanche Terraces

This subsection is on low hills and terraces along the eastern edge of the Great Valley, adjacent to the central Sierra Nevada. The climate is hot and subhumid. MLRA 17e.

Lithology and Stratigraphy. This subsection contains predominantly Eocene, Miocene, and Pliocene nonmarine sedimentary rocks. There are smaller areas of Plio-Pleistocene terraces and recent alluvium.

Geomorphology. This subsection is on gently sloping to moderately steep hills and dissected terraces. There are small areas of floodplain and recent terraces along streams that cross from mountains of the central Sierra Nevada to reach the Sacramento and San Joaquin Rivers. The subsection elevation range is mostly about 200 to 600 feet, but up to 1211 feet on Valley Springs Peak. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly shallow Typic and Ultic Haploxerolls, shallow Typic Xerochrepts, Lithic Mollic Haploxeralfs, and Ultic Palexeralfs. On Plio-Pleistocene terraces there are Haploxeralfs, Palexeralfs, and Durixeralfs. Fluventic Haploxerolls and Aquic Xerofluvents are common on floodplains. Most of the soils are well drained, but some in recent alluvium are somewhat poorly drained. Bicarbonate weathering and leaching and accumulation of clay in subsoils are the main pedogenic processes, plus accumulation of silica in the subsoils of terrace soils. Soil temperature regimes are thermic. Soil moisture regimes are xeric, with some aquic on floodplains.

Vegetation. The predominant natural plant communities are Needlegrass grasslands. There is some Blue oak series, and Northern claypan vernal pools are common. Fremont cottonwood series occurs along streams.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Purple needlegrass series.

Vernal pools: Northern claypan vernal pools.

Forests and woodlands: Fremont cottonwood series, Mixed willow series.

Climate. The mean annual precipitation is about 20 to 25 inches. It is practically all rain. Mean annual temperature is about 58° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Streams in this subsection drain to the Sacramento River. The Cosumnes, Mokelumne, Stanislaus, and Tuolumne Rivers cross the subsection. All but the larger streams are generally dry during the summer. There are no lakes, but there is temporary ponding in vernal pools on Pleistocene terraces.

Subsection 262Ap Lodi Alluvium

This subsection is on nearly level to very gently sloping alluvial fans between the delta of the Sacramento and San Joaquin Rivers and terraces along the eastern edge of the Central Valley. The climate is hot and subhumid. MLRA 17e.

Lithology and Stratigraphy. This subsection contains recent alluvium. The alluvium is mostly from granitic rock sources, but some is from volcanic, sedimentary, and metamorphic rock sources.

Geomorphology. This subsection is on a nearly level to very gently sloping plain. It consists of the floodplains and alluvial fans of the Mokelumne and Calaveras Rivers and smaller streams. The subsection elevation range is about 20 to 100 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic, Pachic, and Calcic Pachic Haploxerolls and Typic Haploxeralfs. Also, there are Fluventic Haploxerolls and Aquic Xerofluvents on floodplains. The soils are mostly well drained, but some on floodplains are

Subsection 262Ao, south of Milton — *Robert Ettner*

somewhat poorly drained. Soil temperature regimes are thermic. Soil moisture regimes are mostly xeric, with some aquic.

Vegetation. The predominant natural plant communities are Needlegrass grasslands and Valley oak series. Fremont cottonwood series occurs along streams.

> **Characteristic series by lifeform include:**
> *Grasslands*: California annual grassland series, Purple needlegrass series.
> *Forests and woodlands*: Fremont cottonwood series, Valley oak series.

Climate. The mean annual precipitation is about 16 to 18 inches. It is practically all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Streams in this subsection drain to the delta area of the Sacramento and San Joaquin Rivers. All but the larger streams are generally dry during the summer. There are no lakes.

Subsection 262Aq Westside Alluvial Fans and Terraces

This subsection is on terraces and alluvial fans along the western edge of the San Joaquin Valley, adjacent to Coast Ranges. The climate is hot and semi-arid to subhumid. MLRAs 15e, 15f, and 17e.

Lithology and Stratigraphy. This subsection contains mostly Quaternary alluvium, and some Plio-Pleistocene sediments. The alluvium is predominantly from sedimentary rocks sources in the Coast Ranges. There are small areas of Eocene, Miocene, and Pliocene sedimentary rocks.

Geomorphology. This subsection is on very gently to gently sloping terraces and alluvial fans. The San Joaquin Valley is asymmetrical, with shorter and steeper alluvial fans adjacent to the Coast Ranges than adjacent to the Sierra Nevada. Also, most of the drainage from the southern Coast Ranges is toward the Pacific Ocean, so there are few large streams draining across the terraces and alluvial fans on the west side of the San Joaquin Valley. The subsection elevation range is from 0 to about 1500 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are Typic Xerofluvents, Typic and Calcixerollic Xerochrepts, Calcic and Aquic Haploxerolls, Typic and Mollic Haploxeralfs, Typic Chromoxererts, Typic and Chromic Pelloxererts, Aquic Natrixeralfs and Typic Palexeralfs. In drier areas near the southern end of the subsection there are Torriorthents, Camborthids, Haplargids, and Natrargids. Xeropsamments predominate in the Antioch dunes at the north end of the subsection. Most of the soils are well drained, but some are somewhat poorly well drained. Calcium carbonates, and even sodium, accumulate in some of the soils. Soil temperature regimes are thermic. Soil moisture regimes are xeric, and, in the southern end of the subsection, aridic.

Subsection 262Aq, vineyard on Haplargid soil — *Anon.*

Vegetation. The predominant natural plant communities are Needlegrass grasslands, and, in drier areas, California annual grass series. There are some Valley oak series and Northern claypan vernal pools.

> **Characteristic series by lifeform include:**
> *Grasslands*: California annual grassland series, Purple needlegrass series.
> *Vernal pools*: Northern claypan vernal pools.
> *Shrublands*: Bladderpod - California ephedra - narrowleaf goldenbush series.
> *Forests and woodlands*: Stands at Antioch dunes, California sycamore series, Fremont cottonwood series.

Climate. The mean annual precipitation is about 8 to 16 inches. It is practically all rain. Precipitation increases both toward the mountains of the southern California Coast Ranges and toward the northern end of the subsection. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Streams in this subsection drain to the San Joaquin River. All but the larger streams are generally dry during the summer. There are no lakes, but there is temporary ponding in vernal pools on Pleistocene terraces.

Subsection 262Ar
Caswell Basin

This subsection is on the floodplain of the San Joaquin River just upstream from the delta area. The climate is hot and subhumid. MLRA 17e.

Lithology and Stratigraphy. This subsection contains recent alluvium.

Geomorphology. This subsection is on nearly level floodplain and basin floors, and on some alluvial fans along the western edge of the subsection. The subsection elevation range is from less than 10 to about 60 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Fluvaquentic Haploxerolls, Aquic Xerofluvents, and Cumulic Haplaquolls. There are small areas of Natrixeralfs, Durixeralfs, and Pelloxererts. The soils are mostly poorly drained and some are moderately well and well drained. Soil temperature regimes are thermic. Soil moisture regimes are mostly aquic, and some are xeric.

Vegetation. The predominant natural plant communities are Emergent aquatic communities. Fremont cottonwood series occurs along streams. Valley oak series occurs on well and moderately well drained soils.

Characteristic series by lifeform include:
Wetlands: Bulrush series, Bulrush - cattail series, Cattail series, Ditch-grass series, Sedge series.
Forests and woodlands: Fremont cottonwood series, Mixed willow series, Valley oak series.

Climate. The mean annual precipitation is about 10 to 12 inches. It is practically all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. The San Joaquin River overflows onto this area. The subsection is drained by the San Joaquin River and its overflow channels. There are no permanent lakes.

Subsection 262As
Manteca - Merced Alluvium

This subsection is on alluvial fans and flood plains of streams that cross the fans from the Sierra Nevada to reach the San Joaquin River. The climate is hot and subhumid. MLRA 17e.

Lithology and Stratigraphy. This subsection contains mostly late Quaternary alluvium. The alluvium is predominantly from granitic rock sources in the southern Sierra Nevada.

Subsection 262As, northeast of Merced — *Robert Ettner*

Geomorphology. This subsection is on very gently to gently sloping floodplains and alluvial fans along and between streams that cross from mountains of the Sierra to reach the San Joaquin River. The subsection elevation range is from 20 to about 180 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly in Typic subgroups of Xeropsamments, Xerorthents, Haploxerolls, and Haploxeralfs. Natric Durixeralfs are common in the drier south end of the subsection. Soils on floodplains along the main rivers are mostly Fluventic Haploxerolls and Aquic Xerofluvents. The soils are well drained, except for Aeric Haplaquepts on alluvial fans. Bicarbonate weathering and leaching and accumulation of clay and silica in subsoils are the main pedogenic processes in the alluvial fan soils. Calcium carbonates accumulate in some of the soils. Soil temperature regimes are thermic. Soil moisture regimes are mostly xeric, with some aquic.

Vegetation. The predominant natural plant communities are Needlegrass grasslands and Valley oak series. Fremont cottonwood series occurs along streams.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.
Shrublands: Button bush series.
Forests and woodlands: Fremont cottonwood series, Mixed willow series.

Climate. The mean annual precipitation is about 10 to 14 inches. It is practically all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Streams in this subsection drain to the San Joaquin River. All but the larger streams are generally dry during the summer. The Stanislaus, Tuolumne, and Merced Rivers cross this subsection. There are no lakes.

Subsection 262At San Joaquin Basin

This subsection is on floodplains and basin floor in the middle of the San Joaquin Valley. It is between alluvial fans from the Coast Ranges on the west and alluvial fans from the Sierra Nevada of the east. The climate is hot and subhumid. MLRA 17e.

Lithology and Stratigraphy. This subsection contains late Quaternary alluvium.

Geomorphology. This subsection is on nearly level floodplains and basin floors. The subsection elevation range is about 60 to 100 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Vertic and Cumulic Haplaquolls, Albic and Glossic Natraqualfs, Aeric and Vertic Haplaquepts, and Aquic subgroups of Xerochrepts, Chromoxererts, Haploxerolls, Haploxeralfs, and Natrixeralfs. Pachic Haploxerolls and Fluvaquentic Haploxerolls are common on levees along streams. Sodium accumulates in soils with slowly permeable subsoils. Most of the soils are poorly drained, and some along streams are well to moderately well drained. Soil temperature regimes are thermic. Soil moisture regimes are mostly aquic, with some xeric.

Vegetation. The predominant natural plant communities are Emergent aquatic communities and Allscale series.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, Creeping ryegrass series, Saltgrass series.

Wetlands: Bulrush series, Bulrush - cattail series, Cattail series, Ditch-grass series, Sedge series.

Shrublands: Allscale series, Arrow weed series, Button bush series.

Climate. The mean annual precipitation is about 8 to 10 inches. It is practically all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. The San Joaquin River and lateral streams flood most of this area periodically. The streams and overflow channels in this subsection run parallel to the San Joaquin River. There are no permanent lakes.

Subsection 262At, wetlands north of Los Banos — *Kerry Arroues*

Subsection 262Au Granitic Alluvial Fans and Terraces

This subsection is on alluvial fans that are below older fans or terraces on the east side of the San Joaquin Valley. The climate is hot and subhumid. MLRA 17f.

Lithology and Stratigraphy. This subsection contains late Quaternary alluvium. The alluvium is predominantly from granitic rock sources in the southern Sierra Nevada.

Geomorphology. This subsection is nearly level to very gently sloping alluvial fans and basins. There are small areas of floodplain along streams that cross from mountains of the Sierra Nevada to reach basins in the San Joaquin Valley. The subsection elevation range is from 150 to about 400 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are Typic Xerofluvents, Typic Xerorthents, Typic Xeropsamments, Haploxerolls, Entic Durochrepts, Typic and Natric Haploxeralfs, Typic and Aquic Natrixeralfs, Natric Durixeralfs, and Typic and Aeric Haplaquepts. The Haploxerolls are in Fluventic, Entic, Cumulic, and Aquic subgroups. Also, there are Typic Endoaquepts, Fluvaquentic Endoaquolls, and Sodic Endoaquerts in basin-fill at the toes of the alluvial fans. The soils are mostly well drained on the fans to poorly drained in the basins. Bicarbonate weathering and leaching and accumulation of clay and silica in subsoils are the main pedogenic processes in the terrace soils. Calcium carbonates accumulate in some of the soils, and sodium accumulates in soils with poor drainage or slowly permeable subsoils. The soil temperature regimes are thermic. Soil moisture regimes are xeric and aquic.

Vegetation. The predominant natural plant communities are Needlegrass grasslands and Valley oak series on alluvial fans, Fremont cottonwood series along some streams,

Subsection 262Au, northeast of Woodville — *Robert Ettner*

Emergent aquatic communities in basins, and Allscale series around the margins of basins.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, California annual grassland series, Creeping ryegrass series, Purple needlegrass series, Saltgrass series.

Wetlands: Bulrush series, Bulrush - cattail series, Cattail series, Ditch-grass series, Sedge series.

Shrublands: Allscale series, Arrow weed series.

Forests and woodlands: Fremont cottonwood series, Mixed willow series, Valley oak series.

Climate. The mean annual precipitation is about 8 to 12 inches; it is practically all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Streams in this subsection drain to basins at the toes of the alluvial fans. Those on the north side of the Kings River fan drain to the San Joaquin River and those on the south side of the fan drain to the Tulare Basin. Streams in the basin draining to the San Joaquin River are parallel to the axis of the Central Valley, perpendicular to those on the fans. All but the larger streams are generally dry during the summer. There are no permanent lakes.

Subsection 262Av
Tulare Basin

This subsection is in a lake basin near the southern end of the San Joaquin Valley. The climate is hot and semi-arid. MLRA 17g.

Lithology and Stratigraphy. This subsection contains Quaternary lacustrine sediments. They are fine-grained deposits derived from both the southern Sierra Nevada and the southern Coast Ranges.

Geomorphology. This subsection is on a level lake basin. It is covered by water in wet years, but it was covered by a permanent lake before tributary water was diverted for irrigation. The subsection elevation range is from 180 to about 200 feet. Lacustrine processes have dominated in the past, but fluvial and eolian processes are now important.

Soils. The soils are mostly Vertic Haplaquolls, but also Sodic Endoaquerts, Typic Endoaquepts, and Fluvaquentic Endoaquolls. The soils are poorly drained. Shrink and swell upon drying and wetting and upward movement of soluble salts are the most evident pedogenic processes. Soil temperature regimes are thermic, and soil moisture regimes are aquic.

Vegetation. The predominant natural plant community are Emergent aquatic communities and Saltgrass series.

Characteristic series by lifeform include:
Wetlands: Bulrush series, Bulrush - cattail series, Cattail series, Ditch-grass series, Sedge series.

Climate. The mean annual precipitation is about 6 to 7 inches; it is all rain. Mean annual temperature is about 60° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. This subsection is a basin that is a sink for water from the southern ends of the Sierra Nevada and the Coast Ranges. It is covered by water in wet years, but it was covered by a permanent lake before tributary water was diverted for irrigation.

Subsection 262Aw
Panoche and Cantua Fans and Basins

This subsection is mostly on alluvial fans of streams that drain from the Coast Ranges toward the San Joaquin Valley and partly on basin floors in the west central part of the Valley. The climate is hot and semi-arid. MLRAs 15f and 17f.

Lithology and Stratigraphy. This subsection contains late Quaternary alluvium. The alluvium is predominantly from sedimentary rocks sources in the Coast Ranges.

Geomorphology. This subsection is on nearly level to gently sloping alluvial fans and basins. There are small areas of floodplain along streams that cross from mountains of the Coast Ranges to reach basins in the San Joaquin Valley. The subsection elevation range is from 170 to about 600 feet. Fluvial erosion and deposition are the main geomorphic processes.

Subsection 262Aw, salt affected soils — *Kerry Arroues*

Soils. The soils are mostly Typic and Vertic Torrifluvents and Typic Torriorthents, and, on basin floors, Typic Natrargids. The soils are well drained. Leaching and accumulation of clay and calcium carbonates in subsoils are the main pedogenic processes. Sodium accumulates in soils on the basin floors. Soil temperature regimes are thermic, and soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Needlegrass grasslands, with Greasewood series on floodplains and basin floors.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Purple needlegrass series.

Shrublands: Bladderpod - California ephedra - narrowleaf goldenbush series.

Climate. The mean annual precipitation is about 6 to 8 inches; it is all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. The main streams from the Coast Ranges are Panoche Creek, Cantua Creek, and Warthan and Zapato Creeks. Warthan and Zapato Creeks converge to Arroyo Pasajero. Thus, there are three major fans—those of Panoche Creek, Cantua Creek, and Arroyo Pasajero. Streams in this subsection drain to basins at the toes of the alluvial fans. Drainage in the basins is parallel to the axis of Central Valley. It is to the San Joaquin River north of the Arroyo Pasajero fan and to the Tulare Basin south of the Arroyo Pasajero fan. The streams dry during the summer. There are no permanent lakes.

Subsection 262Ax Antelope Plain

This subsection is on alluvial fans along the southwestern edge of the San Joaquin Valley. The climate is hot and arid. MLRAs 15f and 17f.

Lithology and Stratigraphy. This subsection contains late Quaternary alluvium. The alluvium is predominantly from sedimentary rocks sources in the Temblor Range of the Coast Ranges.

Geomorphology. This subsection is on nearly level to gently sloping alluvial fans. The subsection elevation range is from 250 to about 1200 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Torriorthents, and lesser amounts of Typic Natrargids. The soils are well drained. Leaching and accumulation of clay and calcium carbonates in subsoils are the main pedogenic processes, but most of the soils are too young to have argillic and calcic horizons. The soil temperature regimes are thermic. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Allscale series, and, on floodplains and toe slopes, Greasewood series.

Characteristic series by lifeform include:

Grasslands: Alkali sacaton series, California annual grassland series, Creeping ryegrass series, Saltgrass series.

Shrublands: Allscale series, Arrow weed series, Bladderpod - California ephedra - narrowleaf goldenbush series, Pickleweed series, Shadescale series, Spinescale series.

Climate. The mean annual precipitation is about 5 to 6 inches. It is practically all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. The streams drain from the Coast Ranges toward the basin at the toes of the fans. All streams are small and dry during the summer. There are no lakes.

Subsection 262Ay South Valley Alluvium and Basins

This subsection includes the Buena Vista - Kern Lake Basin, the southern end of the Tulare Basin, and surrounding alluvial fans in the southern San Joaquin Valley. The climate is hot and arid. MLRAs 17f and 17g.

Lithology and Stratigraphy. This subsection contains mostly late Quaternary alluvium and lacustrine sediments, but there are small patches of Pliocene or Pleistocene sediments. The alluvium is from rocks in the Sierra Nevada, the Coast Ranges, and the Transverse Ranges.

Geomorphology. This subsection is in a level basin and on nearly level to gently sloping alluvial fans surrounding the basin on three sides. The northern part is in the Tulare Basin. The subsection elevation range is from 220 to about 1200 feet. Fluvial and lacustrine processes predominate.

Soils. The soils are mostly Typic Torriorthents on alluvial fans, Torriorthents and Typic Natrargids on lake beds, Typic and Vertic Torriorthents and Typic Natrargids on basin-fill around the lake beds, and Typic Haplargids on remnants of old terraces. The soils are well drained. Any soils that were once poorly drained have been drained by diverting and pumping water. The soil temperature regimes are thermic. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Allscale series on the basin floor and Needlegrass grasslands on alluvial fans. Mesquite series is common in the basin and some Iodine bush series occurs there.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, California annual grassland series, Creeping ryegrass series, Purple needlegrass series, Saltgrass series.

Shrublands: Bush seepweed series, Allscale series, Arrow weed series, Iodine bush series, Pickleweed series, Shadescale series, Spinescale series, Winter fat series.

Forests and woodlands: Mesquite series.

Climate. The mean annual precipitation is about 5 to 6 inches; it is practically all rain. Mean annual temperature is about 59° to 62° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. This subsection is a basin that is a sink for water from the southern ends of the Sierra Nevada and the Coast Ranges and from the Transverse Ranges. Water that flows north from the Kern River goes into the Tulare Basin and water that flows south from the Kern River goes to the Buena Vista - Kern Lake Basin. The latter basin contained Buena Vista Lake, at least periodically, before the Kern River was controlled for irrigation. It wet years water from Buena Vista Lake overflowed into Kern Lake. These lakes are now dry. Streams on the alluvial fans, except the Kern River, are dry most of each year.

Subsection 262Az
Elk Hills and Southern Valley Terraces

This subsection is on dissected terraces and alluvial fans of the Elk Hills, west of the Buena Vista Basin, and foothills of mountains at the southern end of the Great Valley. The climate is hot and semi-arid to subhumid. MLRAs 15g and 17g.

Lithology and Stratigraphy. This subsection contains mostly marine Miocene sedimentary rocks in hills at the south end of the Great Valley, nonmarine Plio-Pleistocene sediments in the Elk Hills, and late Quaternary alluvium.

Geomorphology. This subsection is on moderately steep to steep hills at the south end of the Great Valley, dissected terraces in the Elk Hills, and nearly level to gently sloping alluvial fans. The fans have nearly level to very gently sloping surfaces and, where they are dissected, moderately steep sideslopes. Some of the terrace remnants are small mesas. The subsection elevation range is mostly from 400 to about 3000 feet, but over 4000 feet in places. Fluvial processes predominate, plus mass wasting in the hills at the south end of the Great Valley.

Soils. The soils are mostly Typic Torriorthents on alluvial fans and terraces, plus some Lithic Torriorthents on dissected terrace sideslopes. They are Calcixerollic Xerochrepts, Calcic Haploxerolls, and Typic Argixerolls on hills at the south end of the Central Valley. The soils are well drained. She soil temperature regimes are thermic. Soil moisture regimes are aridic in the Elk Hills and aridic and xeric in hills at the south end of the subsection.

Vegetation. The predominant natural plant communities are Allscale series in the Elk Hills and Needlegrass grasslands in hills at the south end of the subsection.

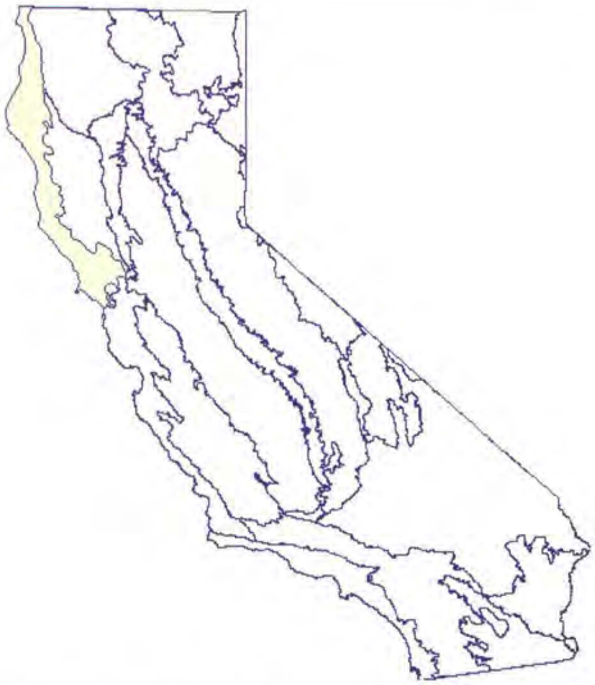
Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, California annual grassland series, Creeping ryegrass series, Purple needlegrass series, Saltgrass series.

Shrublands: Allscale series, Arrow weed series, Big sagebrush series, Bladderpod - California ephedra - narrowleaf goldenbush series, Pickleweed series, Shadescale series, Spinescale series, Winter fat series.

Climate. The mean annual precipitation is about 5 to 6 inches in the Elk Hills and 6 to 8 inches in hills at the south end of the Central Valley. It is practically all rain in the Elk Hills and mostly rain in hills at the south end of the Central Valley. Mean annual temperature is about 50° to 62° F. The mean freeze-free period is about 225 to 275 days.

Surface Water. Streams in the subsection drain toward the Buena Vista - Kern Lake basin. They are dry most of each year. There are no lakes in the subsection.

CHAPTER 4



Section 263A Northern California Coast

This section encompasses mountains, hills, valleys, and plains in the northern California Coast Ranges and small parts of the Klamath mountains that are close enough to the Pacific Ocean for the climate to be modified greatly by marine influence. Summers are characterized by fog, cool temperatures, and higher humidity than that inland. It is in MLRAs 4, 5, 14, and 15.

Geomorphology. Parallel ranges, folded, faulted and metamorphosed strata; rounded crests of subequal height. Coast Ranges Geomorphic province.

Lithology. Late Mesozoic eugeosynclinal rocks of the Franciscan Formation, and shelf and slope sedimentary rocks.

Soil Taxa. Alfisols, Inceptisols, Mollisols, Spodosols (Pygmy Forest), Ultisols and Vertisols in combination with isomesic, mesic or thermic soil temperature regimes, and aquic, udic, ustic or xeric (moist end of range) soil moisture regimes.

Vegetation. Predominant potential natural communities include the Redwood series, Douglas-fir - tanoak series, Oregon white oak series, Purple needlegrass series, Tanoak series and Coast live oak series.

The following series are found throughout the section and are not restricted to, or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Broom series, Giant reed series, Cheatgrass series, Eucalyptus series, Iceplant series, Kentucky bluegrass series, Pampas grass series and Yellow bush lupine series north of Sonoma County.
>
> *Series that can occur in all subsections, but are not extensive*: Bulrush series, Bulrush - cattail series, Burreed series, California oatgrass, Cattail series, Common reed series, Creeping ryegrass series, Duckweed series, Fen habitat, Idaho fescue series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Sedge series, Spikerush series, Tufted hairgrass series and Yellow pond-lily series.
>
> *Series dominated by willows restricted to riparian settings*: Arroyo willow series, Hooker willow series, Mixed willow series, Narrowleaf willow series, Pacific willow series, Red willow series, Sandbar willow series and Sitka willow series.
>
> *Disturbance series of short-lived vegetation*: Blue blossom series, Coyote bush series away from the coast, Deerbrush series, Eastwood manzanita series, Red alder series away from the coast, Tobacco brush series and Wedgeleaf ceanothus series.

Fauna. Mammals include Roosevelt elk, black-tailed deer, black bear, mountain lion, coyote, bobcat, raccoon, skunks, marten, fisher and river otter. Birds include eagles, hawks, owls, peregrine falcon, osprey and a variety shorebirds and waterfowl along the coastal part of the section. Species of concern include marbled murrelet and northern spotted owl. Streams and rivers are used by anadromous fish.

Section 263A, Larabee Buttes area and coastal fog — *David Howell*

Elevation. Sea level to 3,000 feet.

Precipitation. 20 to 120 inches.

Temperature. 40° to 60°F. Summer daytime temperatures often modified by fog and sea breezes.

Growing Season. 225 to 310 days.

Surface Water Characteristics. Many slow or relatively slow streams and rivers in alluvial and weak bedrock channels flowing directly to the Pacific Ocean. Most terminate in tide affected brackish estuaries.

Disturbance Regimes.
Fire: Historic occurrence is changing from frequent, low to high intensity surface fires to infrequent, moderate to high intensity stand replacing fires.
Seismic Activity: Seismically active area with strong shaking and ground rupture.
Flooding: Periodic flooding occurs along major drainages. Landslides initiated by climatic, seismic and human events are common in steep areas of the section.

Land Use. Composition and successional sequence of some communities (primarily grassland communities) has changed because of plant and animal species introduced between the early 1800's and early 1900's related to grazing and forestry. The southern part of the section, and some of the northern part contains expanding urban areas.

Cultural Ecology. Humans have been utilizing the area for some 8,000 to 10,000 years, and have been an integral part of north coast ecology for some 2,000 to 3,000 years, thriving on the diversity of habitats from ocean and estuary to forest, and intensively gathering numerous resources. The variety of Northwest California ethnographic cultures is the most complex in the United States, reflecting diverse prehistoric and historic uses, practices, and human adaptations. The fur trade was a unique part of northwest coast early history, and later lumbering and agriculture were the main economy. Contemporary attitudes and beliefs are dichotomized between emphasis on amenity/newcomer and commodity/long-time resident values, but all overlain by a rural lifestyle, even in the trendy Marin headlands north of San Francisco. The economy is diverse, ranging from San Francisco Bay Area financial and entertainment industries to rural agriculture, forestry and fishing; tourism and recreation are important industries.

Subsections. The Northern California Coast section is divided into 13 subsections.

Subsection 263Aa
Crescent City Plain

This subsection is on a coastal plain between mountains of the northern California Coast Ranges and the Pacific Ocean. The mouth of the Smith River, which drains from the Klamath Mountains, is on this coastal plain. It has a temperate, humid climate with much summer fog. MLRA 4b.

Lithology and Stratigraphy. This subsection contains predominantly Quaternary nonmarine and marine sand and clay coastal plain deposits of the Battery formation. Also, there are substantial areas of beach and dune deposits along the ocean shoreline and recent alluvium and Quaternary fluvial terraces along the Smith River.

Geomorphology. This subsection is on a nearly level coastal plain adjacent to the ocean. Beaches line the outer edge of the plain and dunes of sand spread inland from the beaches. Water is ponded on the plain behind the dunes and a large lake occupies much of the plain. The entire plain is less than 200 feet above mean sea-level. Ocean currents, waves, and wind (coastal marine and eolian processes) are active in forming the beaches and dunes. Fluvial and erosion is the main geomorphic processes on the plain behind the beaches and on terraces along the Smith River.

Soils. The soils are mostly Typic Tropohumults and Typic Humitropepts. Udifluvents and Fluvaquents are common soils on recent alluvium. Tropopsamments occur on dunes. The soil temperature regimes are isomesic. Soil moisture regimes are mostly udic, and some aquic.

Vegetation. The predominant natural plant communities on the plain are Sitka spruce series on the outer edge and Redwood series inland. Red alder series is common

Subsection 263Aa, Lake Earl area — *James R. Nelson* in riparian areas. The dunes support a succession of plant communities, from bare dune through Native dunegrass series, Sand - verbena - beach bursage series, and Beach pine series to Sitka spruce series. Pickleweed series predominates in saltmarsh.

Characteristic series by lifeform include:
Dune vegetation: Native dunegrass series, European beachgrass series, Sand - verbena - beach bursage series.
Saltmarsh vegetation: Pickleweed series, Saltgrass series.
Grasslands: Introduced perennial grassland series.
Shrublands: Coyote brush series, Salal - California huckleberry series.
Forests and woodlands: Beach pine series, Red alder series, Redwood series, Sitka spruce series.

Climate. The mean annual precipitation is about 60 to 80 inches; there is much summer fog. Mean annual temperature is about 53° F, and there is less than 14° F difference between lowest and highest monthly means. The mean freeze-free period is about 300 days.

Surface Water. Water is ponded on the coastal plain to form lakes, with the largest being Lake Earl. The Smith River, a large distributary from the Klamath Mountains, has an outlet on the Plain. Tidal water enters the mouth of the Smith River and may spill over into some of the lakes.

Subsection 263Ab Northern Franciscan

This subsection is in a steep mountainous area of the northern California Coast Ranges with substantial oceanic influence on climate, including summer fog. It is bounded by the South Fork Mountain Thrust fault and a branch of it on the east, by the Pacific Ocean on the west, and by the Grogan fault on the southwest. The climate is temperate and humid. MLRA 4b.

Lithology and Stratigraphy. This subsection is dominated by Jurassic and Cretaceous Franciscan sedimentary, minor volcanic, and metamorphic rocks of the Eastern Belt. They are intensely folded and faulted. Plio-Pleistocene marine and nonmarine sediments are the predominant strata between the Lost Man fault and the ocean, south of the mouth of the Klamath River. There are small areas of recent alluvium along the Klamath and Smith Rivers and Pleistocene gravels on mountain ridges between the Klamath River and the Lost Man fault.

Geomorphology. This is a subsection of mountains with rounded ridges, steep and moderately steep sides, and narrow canyons. Most of the mountains are elongated in north-northwest to northwest directions and have subequal summits with increasing elevation toward the interior. Plio-Pleistocene sediments southwest of the Lost Man fault have been elevated nearly 1000 feet above sea-level and highly dissected. The subsection elevation range is from sea-level up to 3092 feet on School House Peak. Mass wasting and fluvial erosion are the main geomorphic processes. The density (area/area) of landslides is very high.

Subsection 263Ab, Del Norte Coast, Redwood State Park —*James R. Nelson*

Soils. The soils are mostly Typic Humitropepts and Mollic Hapludalfs. Typic Tropohumults and Ultic Hapludalfs are the common soils on Plio-Pleistocene sediments. Typic Tropofluvents and Cumulic Humaquepts occur in alluvium along the major streams. Most of the soils are leached free of carbonates and the older ones are strongly acid. The soil temperature regimes are predominantly isomesic. Soil moisture regimes are mostly udic with some aquic.

Vegetation. The predominant natural plant community is Redwood series. Douglas-fir - tanoak series occurs on upper slopes and ridges. Sitka spruce occurs along the coast. There are patches of Black oak series, Oregon white oak series, and Pacific reedgrass series on south-facing slopes and ridges. Red alder series is common in riparian areas.

Characteristic series by lifeform include:
Grasslands: Introduced perennial grassland series, Pacific reedgrass series.
Saltmarsh vegetation: Pickleweed series, Saltgrass series.
Shrublands: Salal - California huckleberry series.
Forests and woodlands: Black oak series, California bay series, Douglas-fir - tanoak series, Grand fir series, Red alder series, Redwood series, Sitka spruce series, Tanoak series, Western hemlock series.

Climate. The mean annual precipitation is about 60 to 120 inches. Most is rain at lower elevations and some is snow at higher elevations. Mean annual temperature is about 45° to 53° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Runoff is rapid and many of the smaller streams are dry by the end of the summer. The Klamath and Smith Rivers, which drain from the Klamath Mountains, cross this subsection to reach the ocean. Natural lakes are absent, other than minor and temporary ponding by landslides.

Subsection 263Ac San Pablo Bay Flats

This subsection is on parts of the plain north and west of San Pablo Bay that are less than 10 feet above mean sea level. The climate is temperate and subhumid. MLRA 14d.

Lithology and Stratigraphy. This subsection contains Quaternary bay-fill, largely silt and clay.

Geomorphology. This subsection is on a tidal flat. The entire subsection is less than 10 feet above mean sea-level. The main geomorphic processes are coastal marine, and, on the inner edges of the subsection, fluvial.

Soils. The soils are mostly Sulfic Fluvaquents and Endoaquepts, Typic Hydraquents, and Haplaquepts. The soil temperature regimes are isomesic. Soil moisture regimes are aquic.

Vegetation. The predominant natural plant community is Pickleweed series. Saltgrass series is prevalent around the inland margin of the salt marsh. Sedge meadow communities and Emergent aquatic communities are prevalent on the inner edges of the subsection, away from the bay.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Introduced perennial grassland series.

Subsection 263Ac, Northwest of Vallejo — *Charles B. Goudey*

Saltmarsh vegetation: Cordgrass series, Ditch-grass series, Pickleweed series, Saltgrass series.
Freshwater marshes: Bulrush series, Bulrush - cattail series, Cattail series, Duckweed series, Mosquito fern series, Sedge series.

Climate. The mean annual precipitation is about 20 to 30 inches. There is some summer fog. Mean annual temperature is about 56° to 58°F. The mean freeze-free period is about 250 to 275 days.

Surface Water. High tides inundate most of the area. During winter, fresh water flows onto the flats. Deltas of the Napa River and Sonoma, Petaluma, and Novato Creeks are in this subsection.

Subsection 263Ad Wiregrass Ridge

This subsection is a steep mountainous area south-southeast of Orick. It is a narrow strip bounded on the east-northeast by the Grogan fault, which is along Redwood Creek, and on the west-southwest by the Bald Mountain fault. It has a temperate, humid climate.

Subsection 263Ad, near Orick — *Robert Ettner*

There is substantial oceanic influence on climate, including summer fog. MLRA 4b.

Lithology and Stratigraphy. This subsection is dominated by Jurassic and Cretaceous Franciscan sedimentary, minor volcanic, and metamorphic rocks, including the schist of Redwood Creek. They are intensely folded and faulted of the Eastern Belt. There are small areas of recent alluvium along Prairie and Redwood Creeks.

Geomorphology. This is a subsection of mountains with rounded ridges, steep and moderately steep sides, and narrow canyons. Most of the mountains are elongated in north-northwest to northwest directions and have subequal summits with increasing elevation toward the interior. The valleys of Prairie and Redwood Creeks are broad enough near their mouths to contain appreciable floodplain. The subsection elevation range is from sea-level up to 4637 feet on Mt. Andy. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic Humitropepts and less extensive Orthoxic Tropohumults. The soils are leached free of carbonates and the older ones are strongly acid. The soil temperature regimes are predominantly isomesic. Soil moisture regimes are mostly udic.

Vegetation. The predominant natural plant community is Redwood series. Red alder series is common in riparian areas.

Characteristic series by lifeform include:

Grasslands: Introduced perennial grassland series, Pacific reedgrass series.

Shrublands: Coyote brush series, Salal - California huckleberry series.

Forests and woodlands: Black oak series, Red alder series, Redwood series, Tanoak series, Western hemlock series.

Climate. The mean annual precipitation is about 60 to 80 inches. Most is rain at lower elevations and some is snow at higher elevations. Mean annual temperature is about 40° to 53° F. The mean freeze-free period is about 225 to 300 days.

Surface Water. Runoff is rapid and many of the smaller streams are dry by the end of the summer. Natural lakes are absent. Brackish water lagoons are common along the coast.

Subsection 263Ae Humboldt Bay Flats and Terraces

Subsection 263Ae, Humboldt Bay from Loleta bluffs — *Robert Ettner*

This subsection is on a coastal plain and terraces between mountains of the northern California Coast Ranges and the Pacific Ocean. The mouths of the Mad, Van Duzen, and Eel Rivers, which drain much of the northern California Coast Ranges, are on this coastal plain. The subsection climate is temperate and humid. There is substantial oceanic influence on climate, including summer fog. MLRA 4b.

Lithology and Stratigraphy. This subsection is predominantly Quaternary nonmarine and marine terrace deposits and recent alluvium. Also, there are some Plio-Pleistocene nonmarine sediments and, along the ocean shoreline, substantial areas of beach and dune deposits.

Geomorphology. This subsection is on a low coastal plain and marine terraces adjacent to the ocean. Beaches line the outer edge of the plain and dunes of sand spread inland from the beaches. There is a large bay behind this shoreline that has a permanent outlet to the ocean. The Quaternary terraces are only slightly dissected, but the Plio-Pleistocene sediments are highly dissected. They reach elevations up to about 1000 feet. Ocean currents, waves, and wind are active to forming the beaches and dunes. Fluvial erosion and deposition are the main geomorphic processes on the plain and terraces behind the beaches.

Soils. The soils on terraces are mostly Typic Humitropepts and Typic Tropohumults. Tropofluvents, Fluvaquents, and Humaquepts are common soils on recent alluvium. Tropopsamments occur on the dunes. The soil temperature regimes are isomesic and mesic. Soil moisture regimes are mostly udic, and some aquic.

Vegetation. The predominant natural plant communities on the plain and on marine terraces around Trinidad Head and Patricks Point are Sitka spruce series on the outer edge and Redwood series inland. Much of the area has successional cover of shrubs or Red alder series. The dunes support a succession of plant communities, from bare dune through Native dunegrass series, Sand - verbena - beach bursage series, and Beach pine series or Bishop pine series to Sitka spruce series. Pickleweed series is present, but not extensive, in this subsection.

Characteristic series by lifeform include:

Dune vegetation: Native dunegrass series, European beachgrass series, Sand - verbena - beach bursage series.

Saltmarsh vegetation: Cordgrass series, Ditch-grass series, Pickleweed series, Saltgrass series.

Grasslands: Introduced perennial grassland series, Pacific reedgrass series.

Shrublands: Coyote brush series, Salal - California huckleberry series.

Forests and woodlands: Beach pine series, Bishop pine series, Red alder series, Sitka spruce series.

Climate. The mean annual precipitation is about 30 to 50 inches. There is summer fog. Mean annual temperature is about 50° to 53° F, and there is less than 12° F difference between lowest and highest monthly means. The mean freeze-free period is about 300 days.

Surface Water. Water runs off of the terraces rapidly, but there are large areas of floodplain along the Eel, Van Duzen, and Mad Rivers. Tidal water enters Humboldt Bay and the mouths of the Mad and Eel Rivers. Brackish water lagoons are common along the coast.

Subsection 263Af Central Franciscan

This subsection is a steep mountainous area of the northern California Coast Ranges south-southeast of Patricks Point. Most of it is between the Bald Mountain fault on the east-northeast and the Fresh Water fault on the west-southwest. The climate is temperate and humid. There is substantial oceanic influence on climate, including summer fog in the northern part of the subsection. MLRAs 4b and 5b.

Subsection 263Af, Larabee Buttes area and coastal fog — *David Howell*

Lithology and Stratigraphy. This subsection is dominated by Jurassic and Cretaceous Franciscan sedimentary, minor volcanic, and metamorphic rocks of the Central Belt; some Franciscan rocks of the Coastal Belt are present. They are intensely folded and faulted. There are small areas of Tertiary marine sedimentary rocks and ultramafic rocks are sparsely scattered through the Franciscan Complex.

Geomorphology. This is a subsection of mountains with rounded ridges, steep and moderately steep sides, and narrow canyons. Most of the mountains are elongated in north-northwest to northwest directions and have subequal summits with increasing elevation toward the interior. Larabee Valley along the Van Duzen River is wide enough to have an appreciable alluvial plain. The subsection elevation range is from sea-level up to 4408 feet on Showers Mountain. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic Humitropepts and Mollic Hapudalfs in the northern one-third of the subsection. They are predominantly Dystric Xerochrepts and Haploxeralfs in the southern two-thirds of the subsection, and less extensive Ultic Argixerolls. The soils are leached free of carbonates, with the possible exception of some Argixerolls, and the older ones in the northern part of the subsection are strongly acid. The soil temperature regimes are predominantly isomesic in the northern one-third and mesic in the southern two-thirds of the subsection. Soils in grassland in the southern part of the subsection have thermic soil temperature regimes. Soil moisture regimes are predominantly udic and xeric (near udic).

Potential Natural Vegetation. The predominant natural plant communities are Redwood series in the northern one-third and Douglas-fir - tanoak series in the southern two-thirds of the subsection. Needlegrass grasslands are common in the southern part of the subsection, and Oregon white oak series is also common. Common in riparian areas are Red alder series in the northern part and Black cottonwood series in the southern part of the subsection.

Characteristic series by lifeform include:

Grasslands: Introduced perennial grassland series, Purple needlegrass series.

Shrublands: Coyote brush series, Salal - California huckleberry series.

Forests and woodlands: Black cottonwood series, Black oak series, California bay series, Douglas-fir - tanoak series, Grand fir series, Oregon white oak series, Redwood series, Sitka spruce series, Tanoak series, Western hemlock series.

Climate. The mean annual precipitation is about 40 to 80 inches. Most is rain at lower elevations and some is snow at higher elevations. Mean annual temperature is about 40° to 53° F. The mean freeze-free period is about 225 to 300 days.

Surface Water. Runoff is rapid and many of the smaller streams are dry by the end of the summer. Natural lakes are absent.

Subsection 263Ag
Coastal Franciscan

This subsection is a steep mountainous area of the northern California Coast Ranges, near the coast, south from Humboldt Bay to the Russian River. There is substantial oceanic influence on climate, including summer fog. MLRA 4b.

Lithology and Stratigraphy. This subsection is dominated by Cretaceous, Jurassic, and early Tertiary Franciscan marine sedimentary rocks of mostly the Coastal Belt, but includes some of the Central and Eastern Belts. There are relatively small areas of upper Pliocene marine sediments at the north and south ends of the subsection and Tertiary marine sediments in and around the Kings Range. Ultramafic rocks are scattered through the Franciscan Complex.

Subsection 263Ag, King Range from Honeydew area — *David Howell*

Geomorphology. This is a subsection of mountains with rounded ridges, steep and moderately steep sides, and narrow canyons. Most of the mountains are elongated in north-northwest to northwest directions and have subequal summits. There are small areas of Quaternary alluvium along the Van Duzen, Eel, Navarro, and Russian Rivers. The subsection elevation range is from sea-level up to 4088 feet at Kings Peak. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Ultic and Mollic Hapudalfs in the northern part, Ultic Haplustalfs in the southern part, and Ultic and Typic Haploxeralfs in the central and southern interior parts of the subsection. They are predominantly Typic Tropohumults and Ultic Hapludalfs on Tertiary marine sediments east of the King Range. The soils are leached free of carbonates, and some older soils are strongly acid. The soil temperature regimes are predominantly isomesic, but are mesic in the central and southern interior parts of the subsection. Soil moisture regimes are predominantly udic in the northern part, ustic in the southern part, and xeric (nearly udic or ustic) in the central interior part of the subsection.

Vegetation. The predominant natural plant communities are Redwood series, Douglas-fir - tanoak series, and Needlegrass grasslands in the King Range, and Douglas-fir - tanoak series in the central and southern interior parts of the subsection. Canyon live oak series is common on very steep slopes. Sergeant cypress series is common on serpentinitic soils. Black cottonwood series is common in riparian areas.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, European beachgrass series, Foothill needlegrass series, Introduced perennial grassland series, Purple needlegrass series.

Shrublands: Coyote brush series.

Forests and woodlands: Black cottonwood series, Black oak series, Blue oak series, California bay series, Canyon live oak series, Coast live oak series, Douglas-fir - tanoak series, Grand fir series, Interior live oak series, Oregon white oak series, Ponderosa pine series, Redwood series, Sergeant cypress series, Sitka spruce series, Tanoak series, Valley oak series.

Climate. The mean annual precipitation is about 40 to 110 inches. Most is rain at lower elevations and some is snow at higher elevations. Mean annual temperature is about 40° to 53° F. The mean freeze-free period is about 225 to 300 days.

Surface Water. Runoff is rapid and many of the smaller streams are dry by the end of the summer. Natural lakes are absent.

Subsection 263Ah
Fort Bragg Terraces

This subsection is on an elevated coastal plain that is between mountains of the northern California Coast Ranges and the Pacific Ocean. It has a temperate and humid climate, with much summer fog. MLRA 4b.

Lithology and Stratigraphy. This subsection contains predominantly clastic Pleistocene marine deposits and Franciscan marine sedimentary rocks of the Coastal Belt.

Geomorphology. This subsection is on an elevated coastal plain with several levels of terraces. The terraces are nearly level, but they are deeply dissected to expose Franciscan rocks in ravines. The uppermost terrace is about 800 feet above mean sea-level. Ocean currents, waves, and wind are active along the outer edges of the terraces. Fluvial erosion is the main geomorphic process on the terraces, although eolian erosion and deposition has been active in the past. Mass wasting is another process that is active on steep ravine slopes.

Soils. The soils on the terraces are mostly Typic and Plinthic Tropohumults and Dystropepts. Those in Franciscan rock terrain are mostly Ultic Hapudalfs. Less extensive, but notable for the "pygmy forest" on them, are Albaqults and Duraquods. The soil temperature regimes are isomesic. Soil moisture regimes are mostly udic with some aquic.

Subsection 263Ah, Coastal terraces near Navarro River — *Robert Ettner*

Vegetation. The predominant plant community is Redwood series. Grand fir and western hemlock series also occur. Bishop pine series and Pygmy cypress series occur on Albaqults and Duraquods. Red alder series is common in riparian areas.

Characteristic series by lifeform include:

Dune vegetation: Native dunegrass series, European beachgrass series, Sand - verbena - beach bursage series.

Grasslands: Introduced perennial grassland series, Pacific reedgrass series.

Forests and woodlands: Beach pine series, Bishop pine series, Grand fir series, Pygmy cypress series, Red alder series, Redwood series, Western hemlock series.

Climate. The mean annual precipitation is about 40 to 50 inches; there is considerable summer fog. Mean annual temperature is about 50° to 53° F, and there is less than 14° F difference between lowest and highest monthly means. The mean freeze-free period is about 300 days.

Surface Water. Water runs off of the terraces slowly and the broader terraces are poorly drained between ravines that drain the edges of the terraces more rapidly.

Subsection 263Ai Point Arena

This subsection is a narrow strip of coastal plain stretching from Point Arena southeast to about Fort Ross. It is southwest of the San Andreas fault, between the fault and the Pacific Ocean. The climate is temperate and humid. MLRA 4b.

Lithology and Stratigraphy. This subsection contains Eocene marine and nonmarine deposits and some Quaternary marine terrace deposits and Franciscan marine sedimentary rocks of the Coastal Belt.

Geomorphology. This subsection is on an elevated coastal plain with thin Quaternary terrace deposits over Eocene sedimentary rocks that have been eroded to exposed Cretaceous sedimentary rocks. The surface is gently sloping to moderately steep, with some steep-sided ravines crossing the plain. The elevation range is from sea-level up to about 1400 feet. Ocean currents, waves, and wind are active along the outer edges of the coastal plain. Fluvial erosion is the main geomorphic processes on the coastal plain, although eolian erosion and deposition has been active in the past. Mass wasting is another process that is active on steep ravine slopes.

Soils. The soils on terraces are mostly Typic and Plinthic Tropohumults and Dystropepts. Those on Cretaceous sedimentary rocks are mostly Ultic Hapudalfs. There are very small areas of Albaqults. The soil temperature regimes are isomesic. Soil moisture regimes are mostly udic with some aquic.

Vegetation. The predominant natural plant community is Redwood series. There are minor occurrences of Bishop pine series and Pygmy cypress series. Dune lupine - goldenbush series is common on coastal bluffs.

Characteristic series by lifeform include:

Dune vegetation: Native dunegrass series, European beachgrass series, Sand-verbena - beach bursage series.

Grasslands: Introduced perennial grassland series, Pacific reedgrass series.

Shrublands: Dune lupine - goldenbush series.

Forests and woodlands: Grand fir series, Pygmy cypress series, Red alder series.

Climate. The mean annual precipitation is about 30 to 50 inches; there is considerable summer fog. Mean annual temperature is about 50° to 53° F, and there is less than 14° F difference between lowest and highest monthly means. The mean freeze-free period is about 300 days.

Surface Water. Water runs off of the coastal plain moderately slowly to moderately rapidly, with the exception of a few terraces that drain very slowly.

Subsection 263Aj
Coastal Hills - Santa Rosa Plain

This subsection consists of a broad northwest-southeast aligned valley in which the Santa Rosa Plain is located, and the rolling hills between the Pacific Ocean and the Santa Rosa Plain. The description of subsection 263Ak is applicable to Bodega Head and the sand spit that is southwest of the San Andreas Fault. The climate is temperate to hot and humid, with marine air advancing over the hills most of the time. MLRAs 14c and 15c.

Lithology and Stratigraphy. This subsection contains predominantly Pliocene and Quaternary marine and nonmarine sediments and recent alluvium in inland valleys and on the Santa Rosa Plain; and upper Pliocene marine sediments on the hills between the Santa Rosa Plain and the Pacific Ocean. Franciscan rocks of the Central and Coastal Belts are minor components in this subsection.

Subsection 263Aj, west of Petaluma near Fallon — *Charles B. Goudey*

Geomorphology. This subsection contains moderately steep hills on upper Pliocene sediments that have been faulted and eroded to expose rocks of the Franciscan Complex, Quaternary nonmarine terraces, and floodplains. The elevation range is from sea-level up to about 900 feet. Fluvial erosion is the main geomorphic process on the coastal plain and nonmarine terraces. Fluvial erosion and deposition are active on the alluvial plains.

Soils. The soils on the rolling hills are mostly Ultic Haplustalfs. On upper Pliocene sediments of the Santa Rosa Plain they are Haploxerults, Pelloxererts, and Palexeralfs. On Quaternary terraces they are Durixeralfs, Albaqualfs, and Haploxeralfs. And on recent alluvium they are Fluvaquentic Haploxerolls and Pelloxererts. The soil temperature regimes are mesic and thermic inland, mesic on the rolling hills between the Santa Rosa plain and the Pacific Ocean, and isomesic along the coast. Soil moisture regimes are xeric (nearly ustic) and aquic on the Santa Rosa Plain and vicinity, and ustic, and possibly some udic, on the rolling hills west of the Santa Rosa plain and along the coast.

Vegetation. The predominant natural plant communities are Needlegrass grasslands and Valley oak series in the inland valleys. Northern claypan vernal pools occur on the Santa Rosa Plain, and Pacific reedgrass series and Needlegrass grasslands occur on the rolling hills westward to the coast. Coast live oak series is common on some leeward slopes in the rolling hills.

Characteristic series by lifeform include:

Dune vegetation: European beachgrass series, Sand - verbena - beach bursage series.

Saltmarsh vegetation: Pickleweed series, Saltgrass series.

Grasslands: California annual grassland series, Foothill needlegrass series, Introduced perennial grassland series, Pacific reedgrass series, Purple needlegrass series.

Vernal pools. Northern claypan vernal pools.

Shrublands: Dune lupine - goldenbush series.

Forests and woodlands: Coast live oak series, Oregon white oak series, Red alder series, Valley oak series.

Climate. The mean annual precipitation is about 20 to 40 inches; there is summer fog. Mean annual temperature is about 50° to 58° F. The mean freeze-free period is about 225 to 300 days.

Surface Water. Water runs off to streams and alluvial plains moderately rapidly, but it accumulates in slight depressions on alluvial plains. The ephemerally flooded depressions are called vernal pools.

Subsection 263Ak
Point Reyes

This subsection is on the Point Reyes Peninsula. It is bounded by the San Andreas fault on the northeast and by the Pacific Ocean on all other sides. The climate is

Subsection 263Ak, Point Reyes area — *James R. Nelson*

temperate and humid; it is greatly modified by marine air. MLRA 15c.

Lithology and Stratigraphy. This subsection contains predominantly Mesozoic granitic rocks and middle Miocene marine sedimentary rocks adjacent to the San Andreas fault and middle and lower Pliocene marine sedimentary rocks southwest of the Miocene rocks. Also, there are substantial areas of beach and dune deposits along the northwestern ocean shoreline.

Geomorphology. This subsection is on steep hills and mountains adjacent to the San Andreas fault, and an elevated coastal plain from there southwest to Point Reyes. Slopes on the coastal plain are nearly level on remnants of the Pliocene marine surface, to moderately steep below that surface. The elevation ranges from sea-level up to 1407 feet on Mt. Wittenberg. Ocean currents, waves, and wind (coastal marine and eolian processes) are active along the outer edges of the coastal plain. Fluvial erosion is the main geomorphic processes on the coastal plain, although eolian erosion and deposition has been active in the past. Mass wasting is another process that is active on steep slopes in the hills and mountains adjacent to the San Andreas fault.

Soils. The soils of the granitic terrain are mostly Pachic Haplustolls and Ultic Haplustalfs. On the Miocene sedimentary rocks they are Typic Dystropepts and some Lithic Haplustolls. On the Pliocene sedimentary rocks they are Ultic Haplustalfs and Mollisols. And on the recent dunes they are Psamments and Ustic Dystropepts. The soil temperature regimes are mostly isomesic, with some mesic. Soil moisture regimes are mostly ustic, and possibly some udic.

Vegetation. The predominant natural plant communities of granitic terrain are mainly Douglas-fir - tanoak series, Bishop pine series, and Coast live oak series. Plant communities of the Pliocene sedimentary rock terrain are mainly Pacific reedgrass series and Coyote brush series. All of the plant communities of these two terrains may be present in the Miocene sedimentary rock terrain. The dunes support a succession of plant communities, from bare dune through European beachgrass series and Sand - verbena - beach bursage series to Dune lupine - goldenbush series or Yellow bush lupine series.

> **Characteristic series by lifeform include:**
> *Dune vegetation*: Native dunegrass series, European beachgrass series, Sand - verbena - beach bursage series.
> *Saltmarsh vegetation*: Cordgrass series, Ditch-grass series, Pickleweed series, Saltgrass series.

Grasslands: California annual grassland series, Introduced perennial grassland series, Pacific reedgrass series

Shrublands: Dune lupine - goldenbush series.

Forests and woodlands: Bishop pine series, Douglas-fir - tanoak series.

Climate. The mean annual precipitation is about 20 to 40 inches; there is considerable summer fog. Mean annual temperature is about 50° to 53° F, and there is less than 14° F difference between lowest and highest monthly means. The mean freeze-free period is about 275 to 300 days.

Surface Water. Water runs off rapidly, and most of the streams, which are small, are dry by the end of the summer. There are no natural ponds or lakes in the subsection.

Subsection 263Al
Marin Hills and Valleys

This subsection is on mountains and hills between San Francisco Bay and the San Andreas fault that are north of the Golden Gate. The climate is temperate and humid, with substantial marine influence on climate, particularly on the south and west sides of the subsection. MLRA 15c.

Lithology and Stratigraphy. This subsection is dominated by Franciscan sedimentary, minor volcanic, and metamorphic rocks of the Central, Coastal, and Eastern Belts. Most of them are intensely deformed. The Franciscan strata are poorly dated, but they range from Jurassic through Cretaceous, and in the Coastal Belt, into the early Tertiary. Ultramafic rocks are scattered through the Franciscan Complex. There are small areas of Pliocene andesite on the northeast, opposite the Sonoma volcanics, and recent alluvium.

Geomorphology. This is a subsection of mountains and hills with rounded ridges, steep and moderately steep sides, and narrow canyons. Most of the mountains are elongated in north-northwest to northwest directions, although Mt. Tamalpais is oriented southwest-northeast. The elevation ranges from sea-level up to 2604 feet on Mt. Tamalpais. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic Haploxerolls, Entic Haploxerolls, and Ultic Argixerolls, and, in the southwestern part of the subsection, Lithic Haplustolls and Typic and Pachic Argiustolls. The soil temperature regimes are mostly mesic and thermic, and in the southwestern part of the subsection, isomesic. Soil moisture regimes are mostly xeric and, in the southwestern part of the subsection, ustic. Udic soil moisture regimes are common on the lower slopes in steep canyons.

Vegetation. The natural plant communities, from isomesic and udic to thermic and xeric soil temperature and moisture regimes, are mainly Redwood series, Douglas-fir - tanoak series, and Coast live oak series. Grasslands are predominantly California oatgrass series or Pacific reedgrass series in the southwestern part and Needlegrass grasslands in the remainder of the subsection. Chamise series is present on shallow soils.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Foothill needlegrass series, Introduced perennial grassland series, Pacific reedgrass series, Purple needlegrass series.

Shrublands: Chamise series, Leather oak series.

Forests and woodlands: Bishop pine series, Black oak series, California bay series, Coast live oak series, Douglas-fir - tanoak series, Mixed oak series, Redwood series, Sergeant cypress series, Tanoak series, Valley oak series.

Climate. The mean annual precipitation is about 20 to 60 inches; there is considerable summer fog. Mean annual temperature is about 50° to 59° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Water runs off rapidly, and most of the smaller streams are dry by the end of the summer, except in the southwestern part of the subsection. There are no natural ponds or lakes in the subsection, but several reservoirs.

Subsection 263Am
Mt. St Helena Flows and Valleys

This subsection is on the northwest trending Sonoma, Mayacama, and Howell Ranges that are dominated by the Sonoma volcanics, and the valleys of the Napa River and Sonoma Creek between these mountain ranges. MLRAs 14d and 15d.

Subsection 263Al, Hicks Valley area
northwest of Novato — *Charles B. Goudey*

Subsection 263Am, near Kenwood — *Charles B. Goudey*

Lithology and Stratigraphy. This subsection contains predominantly Sonoma volcanics, which are Pliocene basalt to rhyolite flows and pyroclastic rocks. There are moderately large areas of Franciscan rocks of the Central Belt and other Cretaceous sedimentary rocks, presumably of the Great Valley sequence, with considerable ultramafic rock associated with them. Plio-Pleistocene sediments, Quaternary terraces, and recent alluvium are extensive in and around the valleys of the Napa River and Sonoma Creek.

Geomorphology. This subsection contains three parallel mountain ranges and large stream valleys between these ranges. The mountains are steep, with moderately steep hills around their margins. The stream valleys have extensive floodplains and undissected to dissected terraces. The elevation range is from near sea-level in the lower part of the Napa River up to about 4343 feet on Mount St. Helena, but most of the area is below 3000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic Xerochrepts, Lithic Haploxerolls, Vitrandepts, and Ultic Haploxeralfs. On Cretaceous rocks, the main soils are Lithic Xerochrepts, Haploxeralf, and Argixerolls. On Pleistocene sediments the are Typic Haploxerults and Chromic Pelloxererts. On Quaternary terraces they are Haploxeralfs and Durixeralfs. And on late Quaternary or recent alluvium they are Haploxerolls, Argixerolls, and Haploxeralfs. The soil temperature regimes are mesic and thermic. Soil moisture regimes are mostly xeric, and some udic.

Vegetation. The natural plant communities are mainly Coast live oak series, and, to lesser extent, Oregon white oak series, at lower elevations and on south-facing slopes at higher elevations; Douglas-fir series in moist canyons and on north-facing slopes; and Chamise series on shallow soils. There are small areas of Redwood series. Valley oak series and Needlegrass grasslands prevail in the valleys and on terraces.

Characteristic series by lifeform include:

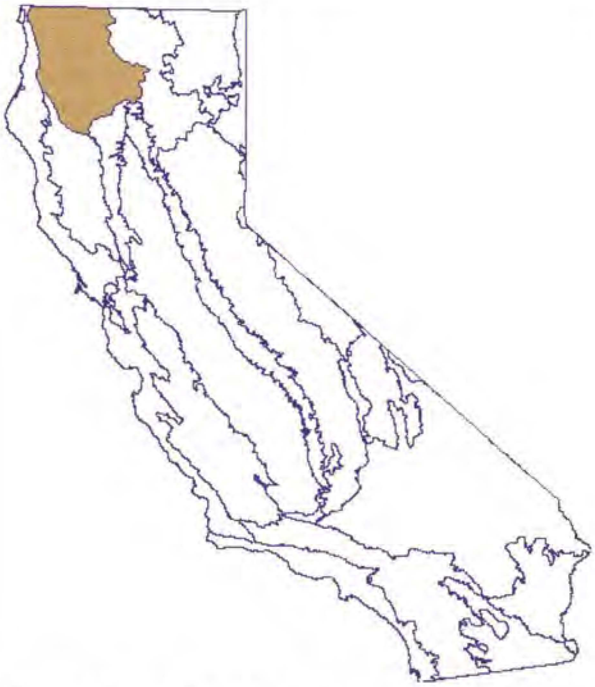
Grasslands: California annual grassland series, Introduced perennial grassland series, Purple needlegrass series.

Forests and woodlands: Black oak series, Coast live oak series, Douglas-fir series, Knobcone pine series, Mixed oak series, Oregon white oak series, Redwood series and Valley oak series.

Climate. The mean annual precipitation is about 20 to 60 inches. Mean annual temperature is about 45° to 58° F. The mean freeze-free period is about 200 to 275 days.

Surface Water. Water runs off to streams and alluvial plains moderately rapidly and all but the larger streams are dry by the end of the summer. There are no natural lakes, but several reservoirs and many artificial ponds.

CHAPTER 5



Section M261A
Klamath Mountains

The Klamath Mountains section is between the Southern Cascade Mountains and the Coast Range mountains. Its southern limit is the northern end of the Great Valley. The section is mostly in MLRA 5, with some hot and relatively dry valleys in MLRA 21.

Geomorphology. Uplifted and dissected peneplain on strong rocks; extensive monadnock ranges. Mountains in this section have accordant or subequal summits and are generally, but not consistently, aligned north-south. Elevations of accordant summits increase from west to east as far as the Eastern Klamath Belt where this trend continues eastward only on the Trinity Ultramafic Sheet. Klamath Mountains geomorphic province.

Lithology. Paleozoic sedimentary and volcanic rocks, and Mesozoic ultramafic, granitic, sedimentary and volcanic rocks.

Soil Taxa. Alfisols, Entisols, Inceptisols, Mollisols and Ultisols in combination with thermic, mesic, frigid or cryic soil temperature regimes and xeric or aquic soil moisture regimes.

Vegetation. Predominant potential natural communities include the Douglas-fir series, Douglas-fir - tanoak series, Jeffrey pine series, Mixed conifer series, White fir series, Douglas-fir - ponderosa pine series, Canyon live oak series, Oregon white oak series, Mixed chaparral shrublands, Red fir series and Mixed subalpine forest series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not placed in subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Broom series, Cheatgrass series, and Kentucky bluegrass series.
>
> *Series that can occur in all subsections, but are not extensive*: Beaked sedge series, Bulrush series, Bulrush - cattail series, Bur-reed series, Cattail series, Creeping ryegrass series, Duckweed series, Idaho fescue series, Introduced perennial grassland series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Quillwort series, Sedge series, Spikerush series, and Tufted hairgrass series.
>
> *Series restricted to riparian settings*: Arroyo willow series, Black cottonwood series, Fremont cottonwood series, Mixed willow series, Montane wetland shrub habitat, Mulefat series, Narrowleaf willow series, Pacific willow series, Red willow series, Sandbar willow series, and White alder series.
>
> *Disturbance series of short-lived vegetation*: Blue blossom series, Deerbrush series, Greenleaf manzanita series in part, Mountain whitethorn series, Tobacco brush series in part, Sadler oak in part, and Wedgeleaf ceanothus series in part.

Fauna. Mammals include Roosevelt elk, black-tailed deer, black bear, mountain lion, coyote, bobcat, ringtail, marten, fisher and river otter. Birds include eagles, hawks, owls, peregrine falcon, osprey and ruffed grouse. Species of concern include marbled murrelet and northern spotted owl. Streams and rivers are used by anadromous fish.

Section M261A, Trinity River area above Trinity Lake — *Scott Miles*

Elevation. 200 to 9,000 feet.

Precipitation. 18 to 120 inches.

Temperature. 30° to 57°F.

Growing Season. 25 to 225 days.

Surface Water Characteristics. Many rapid or moderately rapid flowing rivers and streams. Most rivers flow westerly in deeply incised canyons with bedrock controlled channels. Some easterly flowing streams in deeply incised canyons flow inland to the Sacramento River. Some water is diverted from the westward flowing Trinity River system eastward to the Sacramento River. Numerous lakes and meadows associated with glaciated areas above 5,000 feet.

Disturbance Regimes.
Fire: At lower and mid-elevations, historic occurrence has changed from frequent, low intensity ground fires to infrequent, high intensity stand replacing fires. At higher elevations, historic occurrence has changed from infrequent, low and moderate intensity ground fires to infrequent, low, moderate and high intensity surface or stand replacing fires.
Seismic Activity: Western part is seismically active area with strong shaking and ground rupture.
Climate: Wide fluctuations in precipitation and temperature for periods of years result in significant or catastrophic changes in biological communities. Landslides initiated by climatic, seismic and human events are common in steep areas of the section.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to mining, grazing, forestry and recreational activities.

Cultural Ecology. Humans have been utilizing the Klamath Mountains for about 8,000 years, and have been an integral part of the ecology for 2,000 to 3,000 years. The western portion of the Klamath Mountains lies in the Northwest California culture area; the diversity of Northwest California ethnographic cultures is the most complex in the United States, reflecting diverse prehistoric and historic uses, practices, and human adaptations. Early Euroamerican influences and settlement came from mining booms concomitant with the Gold Rush. Contemporary attitudes and beliefs tend to be dominated by commodity oriented long-time resident values and a rural lifestyle. The economy is dominated by government employment, but the timber industry and recreation are also important.

Subsections. The Klamath Mountains section is divided into 21 subsections.

Subsection M261Aa
Western Jurassic

This subsection is in the Western Jurassic Belt. It is along the western edge of the Klamath Mountains. Marine air moderates the climate of the western part of the subsection. It has a temperate and humid climate. MLRAs 5b and 5c.

Lithology and Stratigraphy. This subsection is dominated by clastic Jurassic marine sedimentary rocks and greenstone of the Galice and Rogue formations. The sedimentary rocks have been slightly metamorphosed to form metagraywacke and slate. In the northern part of the subsection there are some serpentinized peridotite, gabbro, diabase, and volcanic rocks. The rocks are moderately to intensely folded and faulted.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. There are narrow floodplains and high terraces along the Smith, Klamath, and Trinity Rivers and their tributaries. Both large and small landslides are common. The elevation range is about 250 to 4000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Subsection M261Aa, Smith River area —*James R. Nelson*

Soils. The soils are mostly Dystric and Dystric Lithic Xerochrepts, and, from east to west, Ultic Haploxeralfs and Typic Haploxerults. Xeric Haplohumults occur on high terraces. The soils are well drained. Soil temperature regimes are predominantly mesic. Soil moisture regimes are xeric, bordering udic along the western edge of the subsection at the northern end.

Vegetation. The predominant natural plant communities are Douglas-fir - tanoak series and Douglas-fir series. Canyon live oak series is common on very steep rocky slopes with stony soils. Port Orford cedar series occurs on wet mountain sideslopes and along streams. Arroyo willow series and Mixed willow series occur in riparian areas along streams. Jeffrey pine series occur on soils formed from serpentinized peridotite.

Characteristic series by lifeform include:
Grasslands: Rocky Mountains sedge series.

Shrublands: Brewer oak series, Greenleaf manzanita series, Holodiscus series, Montane wetland shrub habitat, Mountain alder series, Sadler oak series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Canyon live oak series, Douglas-fir series, Douglas-fir - tanoak series, Incense-cedar series, Jeffrey pine series, Knobcone pine series, Oregon white oak series, Montane wetland shrub habitat, Red fir series, Western hemlock series, White alder series, White fir series.

Climate. The mean annual precipitation is about 50 to 120 inches. Most of the precipitation is rain at lower elevations, with alternating rain and snow at higher elevations. Mean annual temperature is about 45° to 57° F. The mean freeze-free period is about 100 days at higher elevations to 225 days at lower elevations.

Surface Water. Runoff is rapid. The Smith, Klamath, and Trinity Rivers cross the subsection. Larger tributaries are perennial and smaller streams are mostly perennial. There are no permanent lakes, although temporary and some permanent ponding occurs on and behind some landslides.

Subsection M261Ab Gasquet Mountain Ultramafics

This subsection encompasses ultramafic rocks in the Josephine ophiolite and from the Josephine ophiolite southward along the east side of a thrust fault that separates the Coast Range mountains from the Klamath Mountains. It ends at Burrill Peak, just north of the Klamath River. Marine air moderates the climate of most of the subsection. It has a temperate and humid climate. MLRA 5b.

Lithology and Stratigraphy. This subsection is dominated by partially to completely serpentinized peridotite of a Jurassic-aged ophiolite, called the Josephine ophiolite. Some gabbro and diabase are included in the subsection.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. Some of the mountains have broad summits. Landslides are common, particularly where the peridotite has been completely serpentinized and sheared. The elevation range is about 200 to 4800 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric Xerochrepts, Lithic Xerochrepts, Ultic Haploxeralfs, and Typic Haploxerults. Kandihumults occur on broad mountain summits and mountain benches. Grayer soils are in serpentinitic families and redder soils are in oxidic families. Most of the soils are well drained, but some are poorly drained. Soil temperature regimes are predominantly mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Jeffrey pine series and Lodgepole pine series. Port Orford-cedar series is common on wet mountain sideslopes and along streams. Douglas-fir series and Western white pine series occur on old land surfaces where most of the magnesium (Mg) has been leached from the soils. Darlingtonia series is common in small bogs and fens.

Characteristic series by lifeform include:
Grasslands: Idaho fescue series.

Seeps: Darlingtonia series.

Shrublands: Holodiscus series, Huckleberry oak series, Wedgeleaf ceanothus series.

Forests and woodlands: Douglas-fir series, Douglas-fir - tanoak series, Incense-cedar series, Jeffrey pine series, Knobcone pine series, Lodgepole pine series, Port Orford-cedar series, Western white pine fir, White alder series, White fir series.

Climate. The mean annual precipitation is about 80 to 120 inches. Most of the precipitation is rain at lower elevations, with some snow at higher elevations. Mean annual temperature is about 46° to 57° F. The mean freeze-free period is about 100 days at higher elevations to 225 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Smith River and tributaries of the Klamath River. There are many wet spots, or bogs, on sloping to moderately steep mountain slopes where water seeps from the ground. There are a few small lakes, and temporary ponding occurs on some landslides.

Subsection M261Ac Oregon Mountain

This subsection is in the Central Metamorphic Belt. It stretches from the Trinity Alps southeastward between the Bully Choop and Siskiyou faults to the Great Valley. The climate is temperate and humid. MLRAs 5c and 5d.

Lithology and Stratigraphy. This subsection is dominated by Paleozoic metavolcanic rocks of the Salmon Hornblende Schist, and metasedimentary and metavolcanic rocks of the Abrams Mica Schist, or Grouse Ridge Formation, that are between the Bully Choop fault on the east and the Siskiyou fault on the west. The age of metamorphism is Devonian, which is when the Bully Choop fault was active. Oregon Mountain is an outlier, or klippe, of metamorphosed marine sedimentary rocks from the Eastern Klamath Belt. There are small areas of Lower Cretaceous marine sedimentary rocks of the Great Valley sequence and Oligocene nonmarine sedimentary rocks of the Weaverville formation.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. There is a narrow floodplain and discontinuous terraces along the Trinity River and its tributaries. The elevation range is from about 1500 feet up to 6974 feet on Bully Choop. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic, Dystric, Lithic, and Dystric Lithic Xerochrepts; Ultic Haploxeralfs; and, on older surfaces, Ultic Palexeralfs. Soils on the nonmarine sedimentary deposits are mostly Mollic Haploxeralfs. The soils are well drained. Soil temperature regimes are predominantly mesic, with frigid and some cryic at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Douglas-fir - ponderosa pine series and Mixed conifer series. Canyon live oak series is common on very steep rocky slopes with stony soils. White fir series, and some Red fir series, occurs at higher elevations.

Subsection M261Ac, near Weaverville — *David Howell*

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Brewer oak series, Bush chinquapin series, Chamise series, Chamise - wedgeleaf ceanothus series, Greenleaf manzanita series, Holodiscus series, Huckleberry oak series, Tobacco brush series, Wedgeleaf ceanothus series, Whiteleaf manzanita series.

Forests and woodlands: Blue oak series, Birchleaf mountain-mahogany series, Black oak series, Canyon live oak series, Douglas-fir series, Douglas-fir - ponderosa pine series, Foothill pine series, Interior live oak, Ponderosa pine series, Red fir series, Valley oak series, White alder series, White fir series.

Climate. The mean annual precipitation is about 40 to 70 inches. Most of the precipitation is rain at lower elevations, but much of it is snow at higher elevations. Mean annual temperature is about 40° to 55° F. The mean freeze-free period is about 50 days at higher elevations to 175 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Trinity River and its tributaries, except southeast of Bully Choop where runoff drains to tributaries of the Sacramento River. Larger streams are perennial and smaller ones are mostly ephemeral. There are no natural lakes in the subsection.

Subsection M261Ad Siskiyou Mountains

This subsection is in the Siskiyou Mountains where they are centered along a north-south aligned drainage divide east of the Smith River. It is in the Western Paleozoic and Triassic Belt. The climate is temperate to cold and humid. MLRA 5b.

Lithology and Stratigraphy. This subsection is dominated by serpentinized peridotite, gabbro, diabase, and Paleozoic to Jurassic metavolcanic and metasedimentary rocks of Rattlesnake Creek terrane and by Mesozoic gabbro and granitic rocks. The granitic rocks are generally quartz diorite to slightly more silicic rocks. Quaternary glacial till and outwash occur in many small areas.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. Preston Peak is an individual mountain that stands about 1000 feet or more above subequal summits of other mountains and ridges in the subsection.

Subsection M261Ad, Preston Peak area — *Tom Laurent*

Cirques and moraines occur near the crest of the Siskiyou Mountains and on Preston Peak and the north side of Bear Peak. Both large and small landslides are common. The elevation range is from about 2000 feet up to 7309 feet on Preston Peak. Mass wasting and fluvial erosion are the main geomorphic processes. Glacial processes have been much less extensive.

Soils. The soils are mostly Dystric and Dystric Lithic Xerochrepts and Typic Haploxerults on metamorphic rocks; Ultic Haploxeralfs and Dystric Xerochrepts on gabbro and diabase; Dystric and shallow Dystric Xerochrepts and Typic Haploxerults on granitic rocks; and Lithic Ruptic-Xerorthentic, Typic Xerochrepts and Typic Haploxeralfs on serpentinized peridotite. Soils at the higher elevations are mostly rocky Lithic Xerumbrepts and Dystric Xerochrepts, plus Lithic, Entic, and Typic Xerumbrepts on granitic rocks and Xerumbrepts on glacial till. The soils are well drained, except in small glacial basins. Soil temperature regimes are mesic at lower elevations and frigid, with some cryic, at higher elevations. Soil moisture regimes are xeric.

Vegetation. At lower elevations, the predominant natural plant communities are Douglas-fir - tanoak series and Douglas-fir series, and, on ultramafic rocks, Jeffrey pine series. Canyon live oak series is common on very steep rocky slopes with stony soils. The higher elevations are mostly White fir series, with some Red fir series and Mixed subalpine forest series. Port Orford-cedar series occurs on some wet mountain sideslopes and along streams. There are also some unique plant communities in the Siskiyou Mountains called "Enriched stands in the Klamath Mountains" (Sawyer and Keeler-Wolf, 1995).

Characteristic series by lifeform include: *Grasslands*: Idaho fescue series, Montane meadow habitat, Rocky Mountains sedge series.

Seeps: Darlingtonia series, Fen habitat.

Shrublands: Brewer oak series, Bush chinquapin series, Greenleaf manzanita series, Holodiscus series, Huckleberry oak series, Sadler oak series, Sitka alder series, Subalpine upland shrub habitat, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Alaska yellow-cedar stands, Douglas-fir series, Enriched stands in the Klamath Mountains, Incense-cedar series, Jeffrey pine series, Knobcone pine series, Lodgepole pine series, Mixed subalpine forest series, Mountain hemlock series, Port Orford-cedar series, Red fir series, Western white pine series, White fir series.

Climate. The mean annual precipitation is about 60 to 100 inches. Most of the precipitation is rain at lower elevations, but much of it is snow at higher elevations. Mean annual temperature is about 40° to 53° F. The mean freeze-free period is about 50 days at higher elevations to 175 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Smith River on the west and to the Klamath River and its tributaries on the east. Larger tributaries are perennial and smaller streams are mostly perennial. There are some small lakes, or ponds, in cirque and paternoster basins. Temporary ponding occurs on some landslides.

Subsection M261Ae Scott Bar Mountain

This subsection is on mountains around the lower stretch of the Scott River and the middle stretch of

Subsection M261Ae, near Scott Bar Mountain — *Tom Laurent*

Klamath River. It is in the Western Paleozoic and Triassic Belt and includes some of the Condrey Mountain schist. It has a temperate and subhumid to humid climate. MLRA 5d.

Lithology and Stratigraphy. This subsection contains a variety of Paleozoic to Jurassic metavolcanic and metasedimentary rocks, including components of ophiolitic sequences, of the Rattlesnake Creek, Western Hayfork, and Sawyers Bar terranes. Metamorphic rocks of the Stuart Fork Formation occur between the Soap Creek Ridge fault and the Eastern Klamath Belt. The rocks of this subsection were intruded by Mesozoic granitic rocks, generally quartz diorite to slightly more silicic rocks. The Condrey Mountain Schist, some of which is in this subsection, is a greenschist - blueschist facies volcanic sequence and subduction complex. Cretaceous marine sedimentary rocks of the Hornbrook Formation cover the eastern edge of the subsection.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. Although the mountains are generally aligned toward the north, the Scott Bar Mountains are aligned toward the east-northeast, nearly parallel to the Soap Creek Ridge fault that separates this subsection from the Eastern Klamath Belt. Slopes on Condrey Mountain Schist are generally moderately steep, rather than steep, reflecting its susceptibility to mass wasting. The elevation range is about 1500 to 6300 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric and Dystric Lithic Xerochrepts and Ultic Haploxeralfs. Typic and Pachic Xerumbrepts occur at higher elevations. Soils on granitic rocks are mostly Dystric and shallow Dystric Xerochrepts. Soils on Cretaceous marine sedimentary rocks are mostly Mollic Haploxeralfs, Vertic Argixerolls, and Leptic Haploxererts. The soils are well drained. Soil temperature regimes are predominantly mesic, with some frigid at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Mixed conifer series and Douglas-fir - ponderosa pine series, and, on ultramafic rocks, Jeffrey pine series and Foxtail pine series. Canyon live oak series is common on very steep rocky slopes with stony soils. White fir series, and some Red fir series and Mixed subalpine forest series, occur at higher elevations. Oregon white oak series occurs on the east side of the subsection, particularly on Cretaceous marine sedimentary rocks.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Montane meadow habitat, Nebraska sedge series, Rocky Mountain sedge series.

Shrublands: Big sagebrush series, Brewer oak series, Curlleaf mountain-mahogany series, Bush chinquapin series, Greenleaf manzanita series, Holodiscus series, Huckleberry oak series, Montane wetland shrub habitat, Mountain alder series, Rubber rabbitbrush series, Sitka alder series, Subalpine upland shrub habitat, Subalpine wetland shrub habitat, Tobacco brush series, Wedgeleaf ceanothus series, Whiteleaf manzanita series.

Forests and woodlands: Baker cypress stands, Black oak series, Canyon live oak series, Douglas-fir - Ponderosa pine series, Foxtail pine series, Jeffrey pine series, Mountain hemlock series, Oregon white oak series, Ponderosa pine series, Red fir series, Western juniper series, White fir series.

Climate. The mean annual precipitation is about 20 to 60 inches. Most of the precipitation is rain at lower elevations, but much of it is snow at higher elevations. Mean annual temperature is about 42° to 54° F. The mean freeze-free period is about 75 days at higher elevations to 175 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Scott and Klamath Rivers, which flow through the subsection. All but the larger streams are dry through much or most of summer. There are no lakes in the subsection.

Subsection M261Af Lower Salmon Mountains

This subsection is in the Western Paleozoic and Triassic Belt, near the Klamath River from Thompson Creek to south of the Salmon River. The climate is temperate and humid. MLRA 5c.

Lithology and Stratigraphy. This subsection contains a variety of Paleozoic to Jurassic metavolcanic and metasedimentary rocks, including components of ophiolitic sequences, of mostly Western Hayfork and Rattlesnake Creek terranes, and some Sawyers Bar terrane up Wooley Creek. The rocks were intruded by Mesozoic granitic rocks, generally quartz diorite to slightly more silicic rocks.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. Both large and small landslides are common. Slopes on highly serpentinized peridotite are generally moderately steep, rather than steep, reflecting its susceptibility to mass wasting. There are narrow floodplains and high terraces along the Klamath River and its tributaries. The elevation range is about 600 to nearly 5000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric and Dystric Lithic Xerochrepts, Ultic Haploxeralfs, and Typic Haploxerults. Soils on granitic rocks are mostly Dystric and shallow

Subsection M261Af, lower elevations of Salmon Mountains — *Tom Laurent*

Dystric Xerochrepts. Typic Argixerolls and Typic and Mollic Haploxeralfs occur on serpentinite and serpentinized peridotite. Xeric Haplohumults occur on high terraces and other stable land surfaces. The soils are well drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Douglas-fir - tanoak series, Douglas-fir series, and Mixed conifer series, and, on ultramafic rocks, Jeffrey pine series. Canyon live oak series is common on very steep rocky slopes with stony soils. White fir series occurs at higher elevations.

Characteristic series by lifeform include:
Grasslands: California annual grassland series.
Shrublands: Brewer oak series, Greenleaf manzanita series, Huckleberry oak series, Sadler oak series, Tobacco brush series, Wedgeleaf ceanothus series, Whiteleaf manzanita series.
Forests and woodlands: Black oak series, Canyon live oak series, Douglas-fir series, Douglas-fir - ponderosa pine series, Douglas-fir - tanoak series, Jeffrey pine series, Knobcone pine series, Oregon white oak series, Tanoak series, White alder series, White fir series.

Climate. The mean annual precipitation is about 50 to 80 inches. Most of the precipitation is rain at lower elevations, with some snow at higher elevations. Mean annual temperature is about 45° to 57° F. The mean freeze-free period is about 100 days at higher elevations to 200 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Klamath River, which flows through the subsection. The larger streams are perennial. There are no lakes in the subsection.

Subsection M261Ag Upper Salmon Mountains

This subsection is near the center of the Western Paleozoic and Triassic Belt. It includes the Marble Mountains and mountains from there south-southeast to Deadman Peak in the Salmon Mountains. The climate is cold and humid. MLRAs 5c and 5d.

Lithology and Stratigraphy. This subsection is dominated by Mesozoic granitic rocks and Paleozoic to Jurassic metavolcanic and metasedimentary rocks, including serpentinized peridotite, of mostly Western Hayfork terrane, Rattlesnake Creek terrane north of the Marble Mountain fault, and Sawyers bar terrane south of the Marble Mountain fault. Stuart Fork Formation terrane occurs in the south end of the subsection, southeast of the Soap Creek Ridge fault. The granitic rocks are generally quartz diorite to slightly more silicic rocks. Quaternary glacial till and outwash occur in many small areas.

Geomorphology. This is a subsection of mountains with rounded summits, steep sides, and narrow canyons. The

Subsection M261Ag, upper Salmon Mountains — *Wayne Steffes* mountains are generally aligned toward the north, although the Marble Mountain fault strikes east-west. There are many cirques and moraines in mountain valleys. The elevation range is from about 4500 feet up to 8299 feet on Boulder Peak. Mass wasting and fluvial erosion are the main geomorphic processes. Glacial processes have also been prominent.

Soils. The soils are mostly Lithic, Typic, and Pachic Xerumbrepts and Dystric Xerochrepts on metamorphic rocks, with Haploxerolls on marble. Soils on granitic rocks are mostly Lithic, Entic, Typic, and Pachic Xerumbrepts. Rock outcrop is extensive and Cryumbrepts, Cryochrepts, and Cryoborolls occur at higher elevations. Typic Xerumbrepts occur on glacial till. The soils are well drained, except in small glacial basins. Soil temperature regimes are predominantly frigid, with cryic at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant community is White fir series, with Red fir series, Mountain hemlock series, Mixed subalpine forest series, and Subalpine meadow habitats at higher elevations.

Characteristic series by lifeform include:

Grasslands: Green fescue series, Montane meadow habitat, Nebraska sedge series, Rocky Mountain sedge series, Shorthair reedgrass series, Subalpine meadow habitat.

Seeps: Darlingtonia series.

Shrublands: Brewer oak series, Bush chinquapin series, Greenleaf manzanita series, Holodiscus series, Huckleberry oak series, Low sagebrush series, Montane wetland shrub habitat, Mountain alder series, Mountain heather - bilberry series, Sadler oak series, Sitka alder series, Subalpine upland shrub habitat, Subalpine wetland shrub habitat, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Aspen series, Curlleaf mountain-mahogany series, Douglas-fir series, Enriched stands in the Klamath Mountains, Engelmann spruce series, Foxtail pine series, Incense-cedar series, Jeffrey pine series, Lodgepole pine series, Mixed conifer series, Mixed conifer subalpine series, Mountain hemlock series, Pacific silver fir stands, Red fir series, Subalpine fir series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 60 to 90 inches. Much of the precipitation is snow, especially at higher elevations. Mean annual temperature is about 35° to 46° F. The mean freeze-free period is about 25 days at higher elevations to 100 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Salmon, Scott, and Klamath Rivers and their tributaries. Streams are mostly perennial. There are many small lakes, or ponds, in cirque and paternoster basins.

Subsection M261Ah Scott Valley

This subsection comprises a large valley along the Scott River. It includes Quartz Hill and Chaparral Hill in the north end of the valley. It has a temperate and subhumid climate. MLRA 21e.

Lithology and Stratigraphy. Scott Valley is filled with alluvium derived from Paleozoic to Jurassic metavolcanic, metasedimentary, plutonic, and ultramafic rocks of the Western Paleozoic and Triassic, Eastern Klamath, and Central Metamorphic Belts that are in the mountains around the valley. Chaparral Hill is composed of Stuart Fork Formation rocks and Quartz Hill is in Sawyers Bar terrane of the Western Paleozoic and Triassic Belt.

Geomorphology. This subsection is dominated by a nearly level basin floor and by sloping alluvial fans that skirt the valley. Slopes on the hills are mostly steep. The elevation range is about 2700 on the valley floor up to 4238 feet on Quartz Hill. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Fluvaquentic Haploxerolls and Fluvaquentic Endoaquolls on basin floor and Xerochrepts and Argixerolls on alluvial fans. Ultic Haploxeralfs occur on the hills. The soils are well to poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric and aquic.

Subsection M261Ah, Scott Valley — *Tom Laurent*

Vegetation. The predominant natural plant communities are Oregon white oak series, Ponderosa pine series, and Native grassland, Sedge meadow, and Emergent aquatic communities. Ponderosa pine series and Douglas-fir - ponderosa pine series occur around the margins of the valley and on hills in the valley.

Characteristic series by lifeform include:
Grasslands: Bluebunch wheatgrass series, California annual grassland series, Idaho fescue series, Sedge series, Tufted hairgrass series.

Shrublands: Birchleaf mountain-mahogany series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Douglas-fir - ponderosa pine series, Oregon white oak series, Ponderosa pine series, Water birch series, Western juniper series.

Climate. The mean annual precipitation is about 18 to 25 inches; most of it is rain. Mean annual temperature is about 45° to 50° F. The mean freeze-free period is about 100 days at higher elevations to 125 days on the valley floor.

Surface Water. Runoff is moderately rapid from alluvial fans and slow from basin floor. It drains to the Scott River, which flows through the subsection. There are no natural lakes in the subsection.

Subsection M261Ai
Eastern Klamath Mountains

This subsection is located in the southeastern part of the Klamath Mountains. It is bordered by the Sacramento Valley on the south, the Cascade Ranges on the east, and the Scott Mountains on the northwest. The climate is temperate and humid. MLRAs 5c and 22c.

Lithology and Stratigraphy. This subsection contains a variety of Devonian through Jurassic metavolcanic and metasedimentary rocks, including metamorphosed andesite, rhyolite, pyroclastic rock, graywacke, shale, minor chert, and limestone. From oldest to youngest, they are designated Copley greenstone, Kennett Formation, Bragdon Formation, Baird Formation, McCloud Limestone, Bollibokka Group, Pit Formation, Modin Formation, Arvison Formation, Bagley Andesite, and Potem Formation. Non marine sedimentary rocks of the Weaverville Formation occur in a north-northeast aligned graben that is parallel to the Trinity River in the Musser Hill area.

Subsection M261Ai, Sugarloaf Creek area — *Scott Miles*

Geomorphology. This is a subsection of mountains with rounded summits, steep sides, and narrow canyons. It is hilly with moderately steep slopes, rather than mountainous with steep slopes, in the trough that is occupied by the Weaverville Formation. The elevation range is from about 700 adjacent to the Great Valley up to 6252 feet on Grizzly Peak. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric, Dystric Lithic, and Lithic Xerochrepts, Ultic Haploxeralfs, and Typic Haploxerults. Xeric Haplohumults are common on older land surfaces. Soils on the Weaverville Formation are mostly Mollic Haploxeralfs. The soils are well drained. Soil temperature regimes are predominantly mesic, with some frigid at higher elevations and thermic adjacent to the Great Valley. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Mixed conifer series, Douglas-fir - ponderosa pine series, and Ponderosa pine series. Blue oak series and Mixed chaparral communities occur on south-facing slopes at lower elevations. Canyon live oak series is common on very steep rocky slopes with stony soils. White fir series occurs at higher elevations.

Characteristic series by lifeform include:
Grasslands: California annual grassland series.

Shrublands: Brewer oak series, Chamise series, Chamise-wedgeleaf ceanothus series, Greenleaf manzanita series, Tobacco brush series, Wedgeleaf ceanothus series, Whiteleaf manzanita series.

Forests and woodlands: Birchleaf mountain-mahogany series, Black oak series, Blue oak series, Canyon live oak series, Douglas-fir series, Douglas-fir - ponderosa pine series, Engelmann spruce series, Foothill pine series, Interior live oak series, Knobcone pine series, Jeffrey pine series, Port Orford-cedar series, McNab cypress series, Mixed conifer series, Oregon white oak series, Ponderosa pine series, Valley oak series, White alder series.

Climate. The mean annual precipitation is about 40 to 80 inches. Most of the precipitation is rain at lower elevations, but much of it is snow at higher elevations. Mean annual temperature is about 42° to 56° F. The mean freeze-free period is about 75 days at higher elevations to 200 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Trinity River on the west and to the Sacramento River and its tributaries in the eastern part of the subsection. All but the larger streams are dry through much or most of summer. There are no natural lakes, but there are some reservoirs in the subsection.

Subsection M261Aj Upper Scott Mountains

This subsection comprises the higher elevation portion of the central part of the Eastern Klamath Belt of the Klamath Mountains. The climate is cold and humid. MLRA 5c.

Lithology and Stratigraphy. This subsection is dominated by ultramafic rocks of the Trinity terrane, which is a complex polygenetic assemblage of disrupted Cambrian, Ordivician, Silurian, and Devonian ocean crust that has been intruded by Mesozoic granitic rocks. The terrane is represented by serpentinized peridotite, gabbro, diabase, and minor volcanic rock. The granitic rocks are generally quartz diorite to slightly more silicic rocks. Quaternary glacial till and outwash occur in many areas.

Geomorphology. This is a subsection of mountains with rounded summits, steep sides, and narrow canyons. Cirques and moraines are common in much of the subsection. The elevation range is from about 4000 feet up to 9025 feet on Mount Eddy. Mass wasting and fluvial erosion are the main geomorphic processes. Glacial processes have been active extensively during the Pleistocene and locally during the Holocene.

Subsection M261Aj, upper Scott Mountains — *Wayne Steffes*

Soils. The soils are mostly Typic, Dystric, and Lithic Xerochrepts and Mollic and Ultic Haploxeralfs. Some soils are in serpenitinitic families. Soils on late Pleistocene moraines are mostly Typic Xerochrepts and those on Holocene moraines are mostly Xerorthents and Xerochrepts. Soils on granitic rocks are mostly Entic, Typic and Lithic Xerumbrepts. Typic, Lithic, and Pachic Argixerolls are common in drier areas at the northern end of the subsection. Silica-cemented till is common in soils on moraines, and indurated till and alluvium are exposed in many stream beds. Soils at the higher elevations are mostly rocky Lithic and Typic Cryorthents. The soils are well drained, except in small glacial basins. Soil temperature regimes are mostly frigid, with some cryic at higher elevations and mesic at the northern end of the subsection. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Jeffrey pine series, Mixed conifer series, White fir series, and Montane meadow habitats. Red fir series, Mixed subalpine forest series and Alpine habitats are predominant at higher elevations, and Foxtail pine series is common. Port Orford-cedar series occurs in a few riparian areas.

Characteristic series by lifeform include:

Grasslands: Montane meadow habitat, Subalpine meadow habitat.

Seeps: Darlingtonia series.

Shrublands: Big sagebrush series, Greenleaf manzanita series, Holodiscus series, Huckleberry oak series, Low sagebrush series, Montane wetland shrub habitat, Mountain heather - bilberry series, Subalpine upland shrub habitat, Subalpine wetland shrub habitat, Tobacco brush series.

Forests and woodlands: Curlleaf mountain-mahogany series, Douglas-fir - ponderosa pine series, Enriched stands in the Klamath Mountains, Foxtail pine series, Incense-cedar series, Jeffrey pine series, Lodgepole pine series, Mixed conifer series, Mixed subalpine forest series, Mountain alder series, Mountain hemlock series, Ponderosa pine series, Port Orford-cedar series, Red fir series, Sitka alder series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 30 to 70 inches. Much of the precipitation is snow. Mean annual temperature is about 30° to 45° F. The mean freeze-free period is from less than 25 days at higher elevations to about 100 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Trinity River on the west, the Sacramento and Shasta Rivers on the east, and the Scott

River on the north. Streams are mostly perennial. There are many small lakes, or ponds, in cirque and paternoster basins.

Subsection M261Ak
Lower Scott Mountains

This subsection comprises the lower elevation portion of the central part of the Eastern Klamath Belt of the Klamath Mountains. The climate is temperate and humid. MLRA 5c.

Lithology and Stratigraphy. This subsection is dominated by ultramafic rocks of the Trinity terrane, which is a complex polygenetic assemblage of disrupted Cambrian, Ordivician, Silurian, and Devonian ocean crust that has been intruded by Mesozoic granitic rocks. The terrane is represented by serpentinized peridotite, gabbro, diabase, and minor volcanic rock. The granitic rocks are generally quartz diorite to slightly more silicic rocks.

Geomorphology. This is a subsection of mountains with rounded summits, steep sides, and narrow canyons. The elevation range is about 1500 to 5000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic and Lithic Xerochrepts and Mollic and Ultic Haploxeralfs. Ultic Palexeralfs occur on old land surfaces. Soils on granitic rocks are mostly shallow Dystric Lithic Xerochrepts, Dystric Xerochrepts, and Ultic Haploxerolls. The soils are well drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Jeffrey pine series on ultramafic rocks, Douglas-fir - ponderosa pine series on gabbro and diabase, and Mixed conifer series on granitic rocks. Canyon live oak series occurs on very steep rocky slopes with stony soils.

Subsection M261Ak, Trinity River area above Trinity Lake — *Scott Miles*

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Purple needlegrass series.

Seeps: Darlingtonia series.

Shrublands: Brewer oak series, Greenleaf manzanita series, Wedgeleaf ceanothus series, Whiteleaf manzanita series.

Forests and woodlands: Black oak series, Canyon live oak series, Douglas-fir series, Douglas-fir - ponderosa pine series, Incense-cedar series, Jeffrey pine series, Knobcone pine series, Mixed conifer series, Oregon white oak series, Ponderosa pine series, Port Orford-cedar series.

Climate. The mean annual precipitation is about 40 to 60 inches. Most of the precipitation is rain. Mean annual temperature is about 45° to 55° F. The mean freeze-free period is from about 75 days at higher elevations to 175 days at lower elevations.

Surface Water. Runoff is rapid. It drains mostly to the Trinity River on the west and to the Sacramento River on the east, and a small part of the subsection drains to the Shasta River on the northeast. Larger streams are perennial and most smaller streams are dry by the end of summer. There are no natural lakes in the subsection.

Subsection M261Al
Duzel Rock

This subsection corresponds to the Yreka - Callahan area of the Eastern Klamath Belt of the Klamath Mountains. It is on the eastern edge of the Klamath Mountains, north of the Trinity Ultramafic Sheet, which is also in the Eastern Klamath Belt. The climate is temperate and subhumid. MLRAs 5d.

Lithology and Stratigraphy. This subsection contains some Cambrian plagiogranite and a variety of Cambrian through Devonian metasedimentary and minor metavolcanic rocks. They include Silurian and Devonian metamorphosed conglomerate, sandstone, shale, chert, limestone, and basalt of the Duzel, Moffett Creek, and Gazelle formations. Rocks related to the Trinity terrane occur along the western edge of the subsection, next to the Eastern Klamath Belt. Cretaceous marine sedimentary rocks of the Hornbrook Formation occur along the northern edge of the subsection, on the margin of Shasta Valley. Quaternary alluvium occurs in stream valleys.

Geomorphology. This is a subsection of mountains with rounded summits, steep sides, and narrow canyons. It is hilly, with moderately steep slopes at the northern end of the subsection and on the margin of the Shasta Valley. Floodplains and alluvial fans are most extensive in valleys of East Fork Scott River, Noyes Valley Creek, Yreka Creek, and Julien Creek. The elevation range is from about 2600 up to 6037 feet on Duzel Rock and 6098 feet on Antelope Mountain. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic and Lithic Argixerolls. Soils on Duzel Rock are mostly rocky Lithic Xerorthents and Lithic Haploxerolls. Ultic Haploxeralfs occur on serpentinized peridotite. Soils on alluvial fans and floodplains are mostly Xerochrepts, Argixerolls, Durixeralfs, and Endoaquolls. The soils are well drained, except for some poorly drained soils on floodplains. Soil temperature regimes are predominantly mesic, with some frigid at higher elevations.

Vegetation. The predominant natural plant communities are Western juniper series, Ponderosa pine series, Douglas-fir - ponderosa pine series, and Oregon white oak series. Jeffrey pine series occurs on serpentinized peridotite. Curlleaf mountain-mahogany is common in the western and southern parts of the subsection.

> **Characteristic series by lifeform include:**
> *Grasslands*: California annual grassland series.
>
> *Shrublands*: Big sagebrush series, Brewer oak series, Greenleaf manzanita series, Rubber rabbitbrush series, Tobacco brush series, Wedgeleaf ceanothus series.
>
> *Forests and woodlands*: Black oak series, Douglas-fir series, Douglas-fir - ponderosa pine series, Jeffrey pine series, Oregon white oak series, Ponderosa pine series, Western juniper series, White fir series.

Climate. The mean annual precipitation is about 20 to 30 inches. Most of the precipitation is rain at lower elevations, but much of it is snow at higher elevations. Mean annual temperature is about 42° to 52° F. The mean freeze-free period is about 75 days at higher elevations to 150 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Scott River on the west and to the Shasta River and its tributaries in the eastern part of the subsection. All but the larger streams are dry through much or most of summer. There are no natural lakes in the subsection.

Subsection M261Am Shoemaker Bally

This subsection comprises the Shasta Bally Batholith. It is in the southwestern part of the Eastern Klamath Belt. The climate is temperate to cold and humid. MLRAs 5c, 5d, and 15d.

Lithology and Stratigraphy. This subsection is dominated by a early Cretaceous granitic pluton. The granitic rocks are generally quartz diorite to slightly more silicic rocks.

Geomorphology. This is a subsection of mountains with rounded summits, steep sides, and narrow canyons. It is between the Hoadley fault on the northeast and the Bully Choop fault on the west-southwest, although there are narrow strips of metamorphic rocks between the batholith and the faults. The elevation range is from about 1000 feet up to 6198 feet on Shasta Bally. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic and shallow Xerochrepts, and Ultic Haploxeralfs. Soils at higher elevations are mostly Xerumbrepts. Ultic Palexeralfs occur on older land surfaces. The soils are well drained. Soil temperature regimes are predominantly mesic, with some frigid at higher elevations and thermic adjacent to the Central Valley. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Ponderosa pine series, Douglas-fir - ponderosa pine series, and Mixed conifer series, and, at higher elevations, White fir series.

> **Characteristic series by lifeform include:**
> *Grasslands*: California annual grassland series, Montane meadow habitat.
>
> *Shrublands*: Brewer oak series, Bush chinquapin series, Chamise series, Greenleaf manzanita series, Huckleberry oak series, Tobacco brush series, Wedgeleaf ceanothus series, Whiteleaf manzanita series.
>
> *Forests and woodlands*: Black oak series, Canyon live oak series, Douglas-fir series, Douglas-fir - ponderosa pine series, Foothill pine series, Interior live oak series, Knobcone pine series, Mixed conifer series, Oregon white oak series, Ponderosa pine series, Red fir series, White alder series, White fir series.

Climate. The mean annual precipitation is about 40 to 80 inches. Most of the precipitation is rain, but much of it is snow at higher elevations. Mean annual temperature is about 42° to 56° F. The mean freeze-free period is about 75 days at higher elevations to 200 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Trinity River on the west and to the Sacramento River and its tributaries on the east. All except the larger streams are dry through most of summer at lower elevations and part of summer at higher elevations. There no are natural lakes in the subsection.

Subsection M261An Red Butte

This subsection is along a drainage divide between the Klamath river on the south and the Applegate River on the north. It is in the Western Paleozoic and Triassic Belt. It has a cold and humid climate. MLRAs 5c and 5d.

Lithology and Stratigraphy. This subsection contains a variety of Paleozoic to Jurassic metavolcanic and metasedimentary rocks, including components of ophiolitic sequences, of Rattlesnake Creek and some Western Hayfork terranes. These older rocks were intruded by Mesozoic granitic rocks, generally quartz diorite to slightly more silicic rocks. The Condrey Mountain Schist, some of which is in this subsection, is a greenschist - blueschist facies volcanic and sedimentary sequence and subduction complex. There is some Quaternary glacial till and outwash on the north sides of the higher mountains.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. Slopes on Condrey Mountain Schist are generally moderately steep, rather than steep, reflecting its susceptibility to mass wasting. Cirques and glaciated valleys occur on the north sides of the higher mountains. The elevation range is from about 4000 feet up to 7112 feet on Condrey Mountain. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic, Lithic, and Pachic Xerumbrepts and Ultic Haploxeralfs. Soil temperature regimes are predominantly frigid, with some cryic at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are White fir series, and, at higher elevations, Red fir series. Jeffrey pine series occurs on ultramafic rocks. Mixed subalpine forest series is represented in this subsection, and some unique plant communities called "Enriched stands in the Klamath Mountains" (Sawyer and Keeler-Wolf, 1995).

Subsection M261An, west of Ashland ski area — *Scott Miles*

Characteristic series by lifeform include:

Grasslands: Montane meadow habitat, Subalpine meadow habitat.

Shrublands: Bush chinquapin series, Greenleaf manzanita series, Huckleberry oak series, Montane wetland shrub habitat, Montane wetland shrub habitat, Mountain heather - bilberry series, Mountain alder series, Sadler oak series, Sitka alder series, Subalpine upland shrub habitat. Subalpine wetland shrub habitat, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Alaska yellow-cedar stands, Douglas-fir series, Incense-cedar series, Jeffrey pine series, Mountain hemlock series, Pacific silver fir stands, Red fir series, White fir series.

Climate. The mean annual precipitation is about 50 to 80 inches. Much of the precipitation is snow at lower elevations, and most of it is snow at higher elevations. Mean annual temperature is about 38° to 45° F. The mean freeze-free period is about 75 days at higher elevations to 100 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Applegate River on the north and to Indian Creek and other tributaries of the Klamath River on the south. Many of the smaller streams on the southern sides of the mountains are dry by the end of summer. There are a few lakes, or ponds, in cirque and paternoster basins.

Subsection M261Ao Windy Peak

This subsection is in the Western Paleozoic and Triassic Belt, just north of the Red Butte Subsection. It has a temperate and humid climate. MLRA 5d.

Lithology and Stratigraphy. This subsection contains a variety of Paleozoic to Jurassic metavolcanic and metasedimentary rocks, including components of ophiolitic sequences, of the Rattlesnake Creek and Applegate (Applegate terrane may be correlative with Sawyers Bar terrane) terranes. These older rocks were intruded by Mesozoic granitic rocks, generally quartz diorite to slightly more silicic rocks. The Condrey Mountain Schist, some of which is in this subsection, is a greenschist - blueschist facies volcanic sequence and subduction complex. There is some Quaternary alluvium along streams.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. Both large and small landslides are common. Slopes on Condrey Mountain Schist are generally moderately steep, rather than steep, reflecting its susceptibility to mass wasting. There are narrow floodplains and terraces along the Applegate River and its tributaries. The elevation range is from about 1200 to 5200 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric and Lithic Xerochrepts and Mollic and Ultic Haploxeralfs. The soils are well drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Mixed conifer series and Douglas fir - ponderosa pine series. Jeffrey pine series occurs on ultramafic rocks.

Characteristic series by lifeform include:
Grasslands: Montane meadow habitat.

Shrublands: Bush chinquapin series, Greenleaf manzanita series, Huckleberry oak series, Montane wetland shrub habitat, Montane wetland shrub habitat, Mountain alder series, Sadler oak series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Douglas-fir series, Douglas-fir - ponderosa pine series, Incense-cedar series, Jeffrey pine series, Ponderosa pine series, White fir series.

Climate. The mean annual precipitation is about 50 to 70 inches. Much of the precipitation is rain. Mean annual temperature is about 45° to 55° F. The mean freeze-free period is about 100 days at higher elevations to 175 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Applegate River. Many of the smaller streams are dry by the end of summer. There are no natural lakes in the subsection.

Subsection M261Ap Forks of Salmon

This subsection is mostly in the Western Paleozoic and Triassic Belt, around the North and South Forks of the Salmon River. Some of the Central Metamorphic Belt is included in the southeast part of the subsection. The climate is temperate and humid. MLRA 5c.

Lithology and Stratigraphy. This subsection contains a variety of Paleozoic to Jurassic metavolcanic and metasedimentary rocks, including components of ophiolitic sequences, of mostly Sawyers Bar and some Western Hayfork terranes. The rocks were intruded by Mesozoic granitic rocks, generally quartz diorite to slightly more silicic rocks. Paleozoic metavolcanic rocks of the Salmon Hornblende Schist and metasedimentary and metavolcanic rocks of the Abrams Mica Schist, or Grouse Ridge Formation, occur in the southeast part of the subsection.

Subsection M261Ap, looking south from Blue Ridge Mountain — *Robert Ettner*

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. There are narrow floodplains and high terraces along the Salmon River and its tributaries. The elevation range is about 1000 to 6000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric and Dystric Lithic Xerochrepts and Ultic Haploxeralfs. Soils on granitic rocks are mostly Typic Xerumbrepts. Ultic Palexeralfs occur on high terraces and other stable land surfaces. The soils are well drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Douglas fir series, Douglas-fir - tanoak series, Mixed conifer series and, on the east, Douglas-fir - ponderosa pine series. Jeffrey pine series occurs on ultramafic rocks. Canyon live oak series is common on very steep rocky slopes with stony soils. Oregon white oak series occurs on clayey soils and south-facing slopes at the lower elevations.

Characteristic series by lifeform include:
Grasslands: California annual grassland series,

Shrublands: Bewer oak series, Greenleaf manzanita series, Sadler oak series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Canyon live oak series, Douglas-fir series, Douglas-fir - tanoak series, Douglas-fir - ponderosa pine series, Foothill pine series, Jeffrey pine series, Knobcone pine series, Oregon white oak series, Port Orford-cedar series, Western white pine series, White fir series.

Climate. The mean annual precipitation is about 40 to 80 inches. Most of the precipitation is rain. Mean annual temperature is about 45° to 56° F. The mean freeze-free period is about 75 days at higher elevations to 200 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Salmon River, which flows through the subsection. The larger streams are perennial and some of the smaller streams are ephemeral. There are no lakes in the subsection.

Subsection M261Aq North Trinity Mountain

This subsection is in the Western Paleozoic and Triassic Belt. It is high terrain just west of the Trinity Alps. The climate is cold and humid. MLRA 5c.

Lithology and Stratigraphy. This subsection is dominated by Mesozoic granitic rocks and by Paleozoic to Jurassic gabbro and metavolcanic and metasedimentary rocks, including serpentinized peridotite, of the Western Hayfork and the Sawyers Bar terranes. The granitic rocks are generally quartz diorite to slightly more silicic rocks.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. There are a few cirques on the north sides of the higher mountains. The elevation range is from about 4000 feet up to 7478 feet on Limestone Ridge. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic, Lithic, and Pachic Xerumbrepts. Typic and Dystric Lithic Xerochrepts occur at lower elevations. There are some Haploxeralfs, particularly on highly serpentinized peridotite. Rocky Lithic, Entic, and Typic Cryorthents occur at higher elevations. The soils are well drained. Soil temperature regimes are mostly frigid, with some cryic at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are White fir series, and at higher elevations, Red fir series. Jeffrey pine series occurs on serpentinized peridotite. Mountain hemlock series, Mixed subalpine forest series, and Subalpine meadow habitats occur at higher elevations.

Characteristic series by lifeform include:

Grasslands: Montane meadow habitat, Subalpine meadow habitat.

Shrublands: Brewer oak series, Bush chinquapin series, Greenleaf manzanita series, Holodisus series, Huckleberry oak series, Montane wetland shrub habitat, Montane wetland shrub habitat, Mountain alder series, Sadler oak series, Sitka alder series, Subalpine upland shrub habitat. Subalpine wetland shrub habitat, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Douglas-fir series, Incense-cedar series, Jeffrey pine series, Mixed conifer series, Mountain hemlock series, Red fir series, Western white pine series, White fir series.

Climate. The mean annual precipitation is about 60 to 70 inches. Much of the precipitation is snow, and it is mostly snow at higher elevations. Mean annual temperature is about 35° to 46° F. The mean freeze-free period is about 50 days at higher elevations to 100 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Trinity and Klamath Rivers and their tributaries. Streams are mostly perennial. There are some small lakes in the subsection.

Subsection M261Ar Trinity Mountain - Hayfork

This subsection is in the Western Paleozoic and Triassic Belt. It stretches from the Trinity Mountains southeasterly between the Siskiyou and the Salt Creek faults to the Great Valley. The climate is temperate and humid. MLRAs 5c and 5d.

Lithology and Stratigraphy. This subsection is dominated by Mesozoic granitic rocks and Paleozoic to Jurassic gabbro and metavolcanic and metasedimentary rocks, including serpentinized peridotite, of the Sawyers Bar and Western Hayfork terranes. It is between Siskiyou fault on the east and the Salt Creek fault on the west and southwest. The granitic rocks are generally quartz diorite to slightly more silicic rocks. There are nonmarine sedimentary rocks of the Weaverville

Subsection M261Ar, upper Price Creek area — *Robert Ettner*

Formation in a graben occupied by Hayfork Valley. Quaternary alluvium occurs in Hayfork Valley and along the Trinity River and its tributaries.

Geomorphology. This is a subsection of mountains with rounded summits, steep sides, and narrow canyons. The mountains are generally aligned toward the north, although the Hayfork graben and Hayfork Divide are aligned toward the northeast. Slopes in the Hayfork graben are nearly level on floodplains to moderately steep on the Weaverville Formation. There are floodplains and terraces in Hayfork Valley and along the Trinity River and its tributaries. The elevation range is from about 1800 feet up to 6273 feet on Hayfork Bally. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric and Dystric Lithic Xerochrepts and Ultic Haploxeralfs, plus shallow Dystric Lithic Xerochrepts on granitic rocks and Mollic Haploxeralfs on serpentinized peridotite. Palexeralfs and Mollic Haploxeralfs predominate on the Weaverville Formation. Soils at higher elevations are mostly Typic and Lithic Xerumbrepts. Lithic Xerochrepts, Lithic Argixerolls, and Mollic Haploxeralfs occur at lower elevations, adjacent to the Great Valley. Soils on alluvium in Hayfork Valley are mostly Argixerolls and Aquic Xerofluvents. The soils are well drained, except somewhat poorly drained soils in Hayfork Valley. Soil temperature regimes are mostly mesic, with some frigid at higher elevations and thermic at lower elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Douglas-fir series, Mixed conifer series, Douglas fir - ponderosa pine series, and Ponderosa pine series. White fir series is predominant at higher elevations. Jeffrey pine series occurs on serpentinized peridotite. Oregon white series is predominant in Hayfork Valley. Chamise series and Mixed chaparral communities occur at lower elevations.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Montane meadow habitat.

Shrublands: Brewer oak series, Bush chinquapin series, Chamise series, Greenleaf manzanita series, Holodiscus series, Huckleberry oak series, Tobacco brush series, Wedgeleaf ceanothus series, Whiteleaf manzanita series.

Forests and woodlands: Black oak series, Birchleaf mountain-mahogany series, Canyon live oak series, Douglas-fir series, Douglas-fir - ponderosa pine series, Foothill pine series, Interior live oak series, Jeffrey pine series, Knobcone pine series, Mixed conifer series, Oregon white oak series, Ponderosa pine series, White alder series, White fir series.

Climate. The mean annual precipitation is about 30 to 70 inches. Most of the precipitation is rain; much of it is snow at higher elevations. Mean annual temperature is about 40° to 54° F. The mean freeze-free period is about 75 days at higher elevations to 200 days at lower elevations.

Surface Water. Runoff is rapid. Most of it drains to the Trinity River and its tributaries. Runoff from the southeast end of the subsection drains to Cottonwood Creek, a tributary of the Sacramento River. The streams are mostly perennial on the west, and many of the smaller ones are ephemeral on the east. There are no lakes in the subsection.

Subsection M261As Pelletreau Ridge

This subsection is in the Western Jurassic Belt. It is a narrow, arcuate strip of land along the southwest edge of the Klamath Mountains that is between South Fork Mountain fault on the southwest and the Bear Wallow fault on the northeast. The climate is temperate and humid. MLRA 5c.

Lithology and Stratigraphy. This subsection is dominated by clastic Jurassic marine sedimentary rocks of the Galice formation. These sedimentary rocks have been slightly metamorphosed to form metagraywacke and phyllite. There are small areas of serpentinized peridotite and Mesozoic granitic rocks in the subsection. The rocks are intensely folded and faulted.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. The elevation range is about 1500 to 5000 feet. Mass

Subsection M261As, Hyampom Valley area — *Scott Miles* wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric and Dystric Lithic Xerochrepts, Ultic Haploxeralfs, and Typic Haploxerults. Shallow Dystric Xerochrepts on granitic rocks generally have paralithic contacts, rather than lithic contacts. The soils well drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Douglas-fir series and Douglas-fir - tanoak series. White fir series occurs at the higher elevations. Canyon live oak series is common on very steep rocky slopes with stony soils. Oregon white oak series occurs on clayey soils and south-facing slopes at the lower elevations.

Characteristic series by lifeform include:

Grasslands: Montane meadow habitat.

Shrublands: Greenleaf manzanita series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Douglas-fir series, Douglas-fir - tanoak series, Douglas-fir - ponderosa pine series, Jeffrey pine series, White fir series.

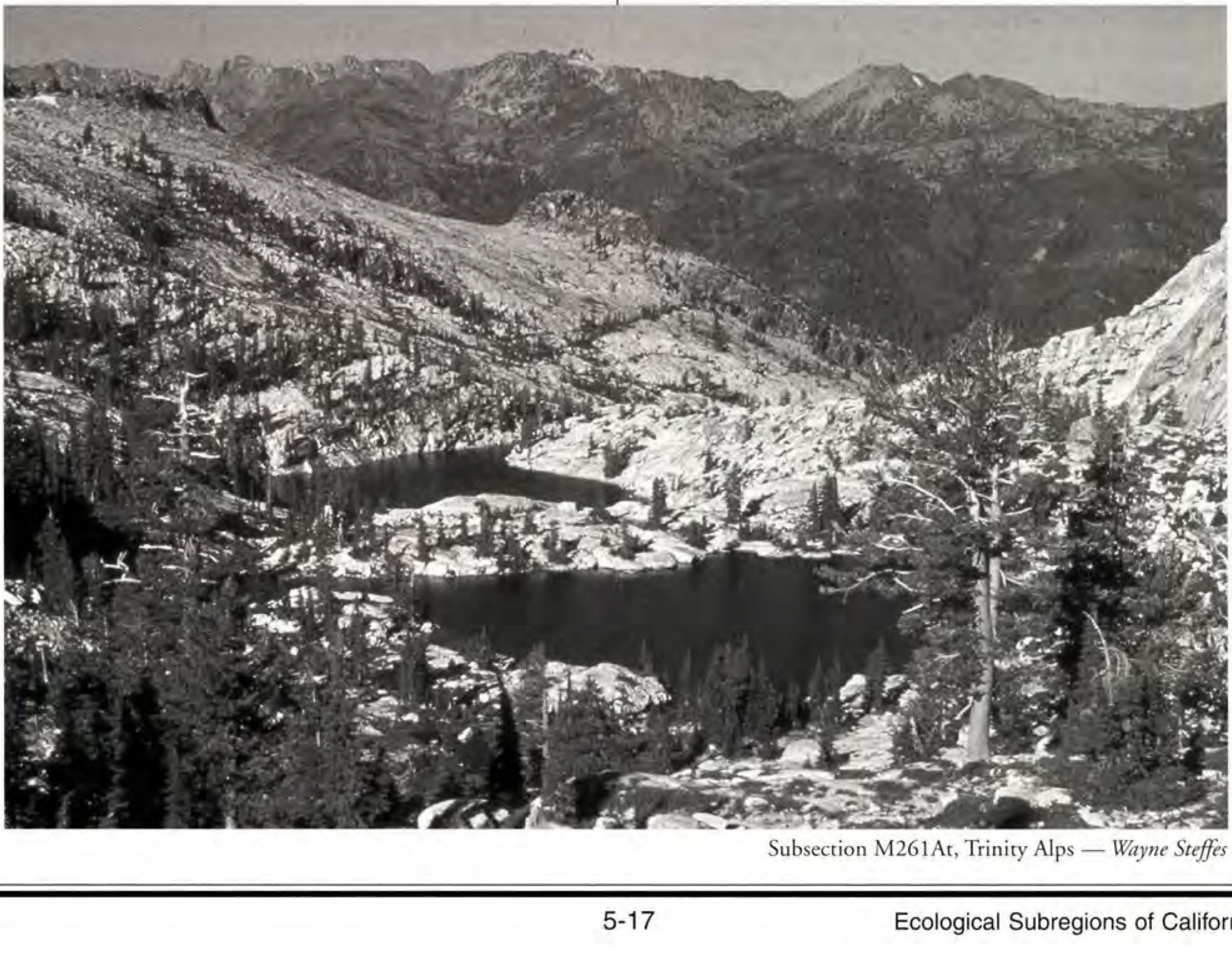
Climate. The mean annual precipitation is about 60 to 80 inches. Most of the precipitation is rain. Mean annual temperature is about 45° to 54° F. The mean freeze-free period is about 100 days at higher elevations to 200 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the South Fork Trinity River. Larger tributaries are perennial and smaller streams are mostly ephemeral. There are no natural lakes in the subsection.

Subsection M261At Trinity Alps

This subsection is in the higher elevation part of the Trinity Alps, in the Central Metamorphic Belt. It has a cold and humid climate. MLRAs 5c and 5d.

Lithology and Stratigraphy. This subsection is dominated by Paleozoic metavolcanic rocks of the Salmon Hornblende Schist and metasedimentary and metavolcanic rocks of the Abrams Mica Schist, or Grouse Ridge Formation, that are between the Trinity fault on the east and the Siskiyou fault on the west. The age of metamorphism is Devonian, which is when the Trinity fault was active. These older rocks were intruded by Mesozoic granitic rocks, generally quartz diorite to slightly more silicic rocks. Quaternary glacial till and outwash occur on high plateaus and occupy many valleys.



Subsection M261At, Trinity Alps — *Wayne Steffes*

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons, except at higher elevation where glaciers have carved cirques, aretes, horns, and U-shaped valleys. Glacial moraines are extensive and outwash terraces occur from moraines down-valley into adjacent subsections. The elevation range is from about 4000 feet up to 9002 feet on Thompson Peak. Mass wasting and fluvial erosion are the main geomorphic processes. Glacial processes have been prominent during the Pleistocene.

Soils. The soils are mostly Dystric Xerochrepts and Lithic, Entic, Typic, and Pachic Xerumbrepts at lower elevations. Soils at higher elevations are mostly Lithic and Typic Cryorthents and Entic and Typic Cryumbrepts. Bare rock is common at higher elevations, particularly on granitic rocks. The soils are well drained. Soil temperature regimes are frigid and cryic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities, from lower to higher elevations, are White fir series, Red fir series, and Mountain hemlock series. Jeffrey pine series, Foxtail pine series, and Mixed subalpine forest series occur on serpentinized peridotite. Vascular plants are absent where bedrock is exposed, except along joints that are prominent in granitic rocks.

Characteristic series by lifeform include:
Grasslands: Green fescue series, Montane meadow habitat, Nebraska sedge series, Rocky Mountain sedge series, Shorthair reedgrass series, Subalpine meadow habitat.

Seeps: Darlingtonia series.

Shrublands: Brewer oak series, Bush chinquapin series, Greenleaf manzanita series, Holodiscus series, Huckleberry oak series, Low sagebrush series, Montane wetland shrub habitat, Mountain alder series, Mountain heather - bilberry series, Sitka alder series, Subalpine upland shrub habitat, Subalpine wetland shrub habitat, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Curlleaf mountain-mahogany series, Douglas-fir series, Douglas-fir - ponderosa pine series, Foxtail pine series, Incense-cedar series, Jeffrey pine series, Lodgepole pine series, Mixed conifer series, Mixed conifer subalpine series, Mountain hemlock series, Red fir series, Subalpine fir series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 60 to 70 inches. Much of the precipitation is snow, and most of it is snow at higher elevations. Mean annual temperature is about 30° to 45° F. The mean freeze-free period is from less than 25 days at higher elevations to about 100 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Trinity River and its tributaries, except for a small area in the northwest part of the subsection which is in the South Fork Salmon watershed. Streams are mostly perennial. There are many small lakes, or ponds, in cirque and paternoster basins.

Subsection M261Au Rattlesnake Creek

This is an arcuate subsection aligned from north-northwest to east-southeast along the southwest edge of the Klamath Mountains. It is the Western Paleozoic and Triassic Belt, bound on the southwest by the South Fork Mountain and Bear Wallow faults and on the northeast by the Salt Creek fault. The climate is temperate and humid. MLRAs 5c and 5d.

Lithology and Stratigraphy. This subsection is dominated by Paleozoic to Jurassic metavolcanic and metasedimentary rocks and serpentinized peridotite of Rattlesnake Creek terrane. These rocks are intensely faulted. There are small areas of Mesozoic granitic rocks in the subsection. There is a small area of Oligocene nonmarine sedimentary rocks of the Weaverville Formation in Hyampom Valley and Quaternary alluvium occurs there and elsewhere along the South Fork Trinity River.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. Narrow floodplains occur along the South Fork Trinity and Trinity Rivers and are broader in Hyampom Valley. The elevation range is from about 400 feet up to 5881 feet on Dubakella Mountain. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric, Dystric Lithic, Lithic, and Typic Xerochrepts and Ultic and Mollic Haploxeralfs. Soils on Lithic and Typic Xerochrepts and Mollic Haploxeralfs are on serpentinized peridotite. Shallow Dystric Xerochrepts on granitic rocks generally have paralithic contacts, rather than lithic contacts. Soils on the Weaverville formation are mostly Argixerolls and those on floodplains are mostly Xerofluvents. The soils well drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Douglas-fir series, Mixed conifer series, Douglas-fir - ponderosa pine series, and Ponderosa pine series. Jeffrey pine series occurs on serpentinized peridotite. Canyon live oak series is common on very steep rocky slopes with stony soils.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Montane meadow habitat.

Subsection M261Au, from Sorth Fork
looking up Hayfork Creek — *Darrel Ranken*

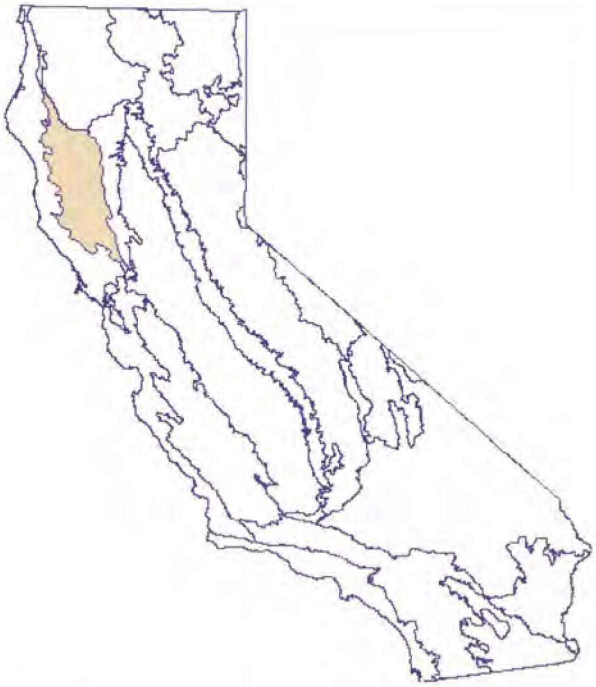
Shrublands: Brewer oak series, Greenleaf manzanita series, Holodiscus series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Birchleaf mountain-mahogany series, Canyon live oak series, Douglas-fir series, Douglas-fir - ponderosa pine series, Foothill pine series, Jeffrey pine series, Knobcone pine series, Mixed conifer series, Oregon white oak series, Ponderosa pine series, White alder series, White fir series.

Climate. The mean annual precipitation is about 40 to 60 inches. Most of the precipitation is rain. Mean annual temperature is about 45° to 57° F. The mean freeze-free period is about 100 days at higher elevations to 225 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the South Fork Trinity River, except at the southeast end of the subsection where runoff drains to tributaries of the Sacramento River. All but the larger streams are dry through most of summer. There are no natural lakes in the subsection.

CHAPTER 6



Section M261B - Northern California Coast Ranges

This section is the interior part of the northern California Coast Ranges mountains, north of the Carquinez Straight. Marine air modifies winter and summer temperatures, but the section is inland from the coast far enough that oceanic effects are greatly diminished. The northern part is in MLRA 5 and the southern part in MLRAs 14 and 15.

Geomorphology. Parallel ranges, folded, faulted and metamorphosed strata; rounded crests of subequal height. Coast Ranges Geomorphic province.

Lithology. Late Mesozoic eugeosynclinal rocks of the Franciscan Formation, Mesozoic ultramafic rocks, and Cenozoic volcanic rocks.

Soil Taxa. Alfisols, Entisols, Inceptisols and Mollisols in combination with frigid, mesic or thermic soil temperature regimes and a xeric soil moisture regime.

Vegetation. Predominant potential natural communities include the Douglas-fir - tanoak series, Blue oak series, Oregon white oak series, Chamise series, Purple needlegrass series, Mixed conifer series and White fir series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

Series dominated by exotic plants: Cheatgrass series, Kentucky bluegrass series and Tamarisk series.

Series that can occur in all subsections, but are not extensive: Bulrush series, Bulrush - cattail series, California oatgrass, Cattail series, Creeping ryegrass series, Duckweed series, Idaho fescue series, Mosquito fern series, Nodding needlegrass series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Quillwort series, Sedge series, Spikerush series, Tufted hairgrass series and Yellow pond-lily series.

Series restricted to riparian settings: Arroyo willow series, Black cottonwood series, Black willow series, Fremont cottonwood series, Mixed willow series, Mulefat series, Narrowleaf willow series, Pacific willow series, Red willow series and White alder series.

Disturbance series of short-lived vegetation: Blue blossom series, Coyote bush series, Deerbrush series, Eastwood manzanita series and Wedgeleaf ceanothus series.

Fauna. Mammals include black-tailed deer, black bear, mountain lion, coyote, bobcat and ringtail. Roosevelt elk, marten and fisher occur in the northern part of the section. Tule elk and mule deer occur in the southern part. Birds include eagles, hawks, owls, herons and osprey. Species of concern include marbled murrelet and northern spotted owl in the northern part.

Elevation. 300 to 8100 feet.

Precipitation. 25 to 120 inches.

Temperature. 35° to 60°F.

Growing Season. 80 - 250 days.

Surface Water Characteristics. Many rapid or moderately rapid rivers and streams in deeply incised canyons with weak bedrock channels flowing westerly to the Pacific Ocean.

Section M261B, Middle Fork of the Eel River — *David Howell*

Disturbance Regimes.
Fire: Historic occurrence has changed from frequent, low, moderate and high intensity surface fires to infrequent, high intensity ground or stand replacing fires.
Seismic Activity: Seismically active area with strong shaking and ground rupture.
Climate: Wide fluctuations in precipitation and temperature for periods of years result in significant or catastrophic changes in biological communities.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to mining, grazing, forestry and recreational activities.

Cultural Ecology. Humans have been utilizing the area for about 10,000 years; the Northern Coast Ranges are the type location for the early, Borax Lake, Paleoindian component. Humans have been an integral part of Coast Range ecology for some 2,000 to 3,000 years. The diversity of Northwest California ethnographic cultures is the most complex in the United States, reflecting diverse prehistoric and historic uses, practices, and human adaptations. Contemporary attitudes and beliefs are dichotomized between emphasis on amenity/newcomer and commodity/long-time resident values, with all overlain by a rural lifestyle. The economy is relatively diverse - government employment, the timber industry, recreation, and agriculture.

Subsections. The Northern California Coast Ranges section is divided into 6 subsections.

Subsection M261Ba
Eastern Franciscan

This subsection is in the higher elevation part of the northern California Coast Ranges that is far enough inland to have little oceanic influence on climate. It has a temperate to cold, humid climate. MLRA 5d.

Lithology and Stratigraphy. This subsection is dominated by Jurassic and Cretaceous Franciscan metaclastic rocks of the Eastern Belt. They are intensely folded and faulted. Ultramafic rocks are minor components in this subsection.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. Most of the mountains are elongated in north-northwest to northwest directions and have subequal summits with increasing elevation toward the interior. The elevation range is from about 1200 feet up to 8092 feet on Mt. Linn in the South Yolla Bolly Mountains. Mass wasting and fluvial erosion are the main geomorphic processes.

Subsection M261Ba, Black Rock Mountain area — *Robert Ettner*

Soils. The soils are mostly Dystric Xerochrepts, Dystric Lithic Xerochrepts, and Lithic Xerorthents. At higher elevations, Typic and Lithic Xerumbrepts are most common. The soils are leached free of carbonates. Few surfaces are old enough, because of active erosion, to have Alfisols or Ultisols. Soil temperature regimes are predominantly mesic, some frigid, and minor cryic. Soil moisture regimes are almost exclusively xeric.

Vegetation. The predominant natural plant community is Mixed conifer series, except in the northern part of the subsection where Douglas-fir - tanoak series is the predominant plant community. Red fir series and White fir series are common in areas of frigid soil temperature regimes.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Introduced perennial grassland series, Montane meadow habitat, Rocky Mountains sedge series.
Shrublands: Brewer oak series, Bush chinquapin series, Chamise series, Chamise - wedgeleaf ceanothus series, Greenleaf manzanita series, Holodiscus series, Leather oak series, Huckleberry oak series, Interior live oak shrub series, Low sagebrush series, Montane wetland shrub habitat, Mountain alder series, Mountain whitethorn series, Rubber rabbitbrush series, Sitka alder series, Tobacco brush series, Whiteleaf manzanita series.
Forests and woodlands: Birchleaf mountain-mahogany series, California buckeye series, Canyon live oak series, Douglas-fir series, Douglas-fir - ponderosa pine series, Douglas-fir - tanoak series, Foothill pine series, Foxtail pine series, Incense-cedar series, Knobcone pine series, Jeffrey pine series, Mixed conifer series, Red fir series, White fir series.

Climate. The mean annual precipitation is about 40 to 120 inches. Most of the precipitation is rain at lower and snow at higher elevations. Mean annual temperature is about 35° to 55° F. The mean freeze-free period is in the range from 100 days at higher elevations to 200 days at low elevations.

Surface Water. Runoff is rapid and all but the larger streams are dry through much of the summer. There are a few small lakes and wet meadows in glacial basins at higher elevations.

Subsection M261Bb Central Franciscan

This subsection is the central part of the northern California Coast Ranges that is influenced somewhat by marine air, but lacks summer fog. It has a temperate and humid climate that is cooler during summer and wetter than the Eastern Franciscan subsection. MLRAs 5c, 5d, 14c, 14d, 15c, and 15d.

Lithology and Stratigraphy. This subsection is dominated by Jurassic and Cretaceous Franciscan graywacke, greenstone, chert, melange, and serpentinite of the Central and other Belts, and, in the southwestern part of the subsection, Cretaceous marine sedimentary rocks other than those of the Franciscan Complex. They are intensely folded and faulted. Nonmarine Pliocene sedimentary rocks are present in some low areas and Quaternary alluvium is present in the valleys.

Geomorphology. This is a subsection of mountains with rounded ridges, steep and moderately steep sides, and narrow canyons, but with several broad valleys (for example, Round Valley and Potter Valley). Most of the mountains are elongated in north-northwest to northwest directions and have subequal summits with increasing elevation toward the interior. The elevation range is from about 300 feet up to 6175 feet on Big Signal Peak. Mass wasting and fluvial erosion are the main geomorphic processes. No other part of California has a greater density (area/area) of landslides.

Subsection M261Bb, east of Alderpoint — *David Howell*

Soils. The soils are mostly Dystric Xerochrepts and lesser amounts of Ultic Haploxeralfs, Xerumbrepts, and Lithic Xerorthents in northern part; and predominantly Ultic Haploxerolls and lesser amounts of Haploxeralfs, Argixerolls, and Dystric Lithic Xerochrepts in the southern part of the subsection. Most of the soils are leached free of carbonates, but the subsoil is calcareous in some Xerolls. Few surfaces are old enough, because of active erosion, to have Palexeralfs, Palexerults, or Palehumults. The soil temperature regimes are predominantly mesic, but includes thermic in the southern part of the subsection. Soil moisture regimes are xeric (nearly udic or ustic).

Vegetation. The predominant natural plant communities are Douglas-fir - tanoak series with Needlegrass grasslands and Oregon white oak series in the northern part; and a mosaic of Mixed conifer series, Needlegrass grasslands, Blue oak series, and Chamise series in the southern part of the subsection. The mosaic is controlled by slope aspect, lithology, and soils. Blue oak series is most common on south-facing slopes and at lower elevations. Needlegrass grasslands are present in areas of Franciscan melange, which are quite susceptible to mass wasting by slide and flow. Chamise series prevails on south-facing slopes with shallow soils.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Introduced perennial grassland series.

Shrublands: Chamise series, Chamise - wedgeleaf ceanothus series, Interior live oak shrub series, Leather oak series, Tobacco brush series, Whiteleaf manzanita series.

Forests and woodlands: Birchleaf mountain-mahogany series, Blue oak series, California buckeye series, Canyon live oak series, Coast live oak series, Douglas-fir - tanoak series, Foothill pine series, Incense-cedar series, Interior live oak series, Knobcone pine series, Sargent cypress series, Valley oak series.

Climate. The mean annual precipitation is about 35 to 110 inches. Most of the precipitation is snow at higher and rainfall at lower elevations. Mean annual temperature is about 40° to 58° F. The mean freeze-free period is from 125 days at higher elevations to 250 days at lower elevations.

Surface Water. Runoff is rapid and all but the larger streams are dry by the end of the summer. Natural lakes are absent, but there are a few reservoirs in the area.

The area is widely known for extremely high sediment delivery by the streams (for example, the Eel River).

Subsection M261Bc Stony Creek Serpentine

This subsection is a narrow strip of predominantly ultramafic and associated rocks of an ophiolite sequence that is between the Coast Range Thrust on the west and the Stony Creek Fault on the east. It has a hot, subhumid climate. MLRAs 15d and 15e.

Lithology and Stratigraphy. This subsection contains mostly Jurassic ophiolitic rocks, including peridotite, gabbro, sheeted dikes, and pillow basalt that have been altered to a melange of basalt, gabbro, and diabase in a serpentinized peridotite matrix. There are relatively small areas of Quaternary alluvium along Stony Creek and in Bear Valley.

Geomorphology. This subsection is along the steep north-trending east edge of the Northern Coast Range mountains. Most of the mountains are elongated in north-northwest to northwest directions. The elevation range is about 1200 feet to 3700 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic Argixerolls in serpentinitic families. Dystric Lithic Xerochrepts and Lithic Mollic Haploxeralfs are common nonserpentinitic soils. There are some Pachic Ultic Argixerolls in colluvium. Typic Pelloxererts predominate in Bear Valley. The mountain soils (excluding Bear Valley) are generally leached free of carbonates. The soil temperature regimes are predominantly thermic, but some are mesic at higher elevation and on north-facing slopes. Soil moisture regimes are almost exclusively xeric.

Vegetation. The predominant natural plant communities are Leather oak series on serpentinitic soils and Chamise series on others. In Bear Valley, the presumed potential natural plant communities are Needlegrass grasslands.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Chamise series, Chamise - wedgeleaf ceanothus series, Leather oak series,

Forests and woodlands: Foothill pine series, Knobcone pine series, McNab cypress series, Sargent cypress series.

Subsection M261Bc — *James R. Nelson*

Climate. The mean annual precipitation is about 25 to 40 inches. Some of the precipitation is snow at higher elevations, but most is rainfall at lower elevations. Mean annual temperature is about 50° to 60° F. The mean freeze-free period is in the range from 150 days at higher elevations to 225 days at lower elevations.

Surface Water. Runoff is rapid and all but the larger streams are dry through most of the summer. Natural lakes are absent.

Subsection M261Bd Clear Lake Hills and Valleys

This subsection is a relatively low part of the Northern Coast Ranges that is surrounded by mountains. Most of the Franciscan rocks in this basin have been covered by late Tertiary sedimentary and volcanic rocks. The volcanics are not included in this subsection. Clear Lake, the largest natural lake in the Coast Ranges, occupies much of this subsection. The subsection has a hot and subhumid climate. MLRA 14d.

Lithology and Stratigraphy. This subsection contains Jurassic and Cretaceous Franciscan rocks of the Central and Eastern Belts, nonmarine Plio-Pleistocene sediments, and Quaternary alluvium.

Geomorphology. This subsection is in a structural low, or graben, in the northern California Coast Range mountains. It contains moderately steep hills, highly dissected Plio-Pleistocene sediments, and nearly level to gently sloping Quaternary alluvial fans, terraces, and basin-fill. The elevation range is about 1300 feet to 2000 feet. Fluvial erosion and fluvial and lacustrine deposition in the basin bottom are the main geomorphic processes. Mass wasting is a minor process, except on ravine sideslopes in the highly dissected Plio-Pleistocene sediments.

Soils. Soils of Franciscan terrain are mostly Lithic Xerochrepts and Mollic Haploxeralfs. Those of gentle to moderately steep slopes that predominate in dissected Plio-Pleistocene sedimentary terrain are mostly Mollic Haploxeralfs. Fluventic and Cumulic Haploxerolls, Aeric Fluvaquents, Fluventic Haplaquolls, and Pelloxererts are common in alluvial fan and basin-fill deposits, and Ultic Palexeralfs on terraces. The hill and terrace soils are generally leached free of carbonates, but calcium carbonates and salts accumulate in basin-fill. Soil temperature regimes are thermic. Soil moisture regimes are xeric, except for some soils with aquic moisture regimes in alluvium around Clear Lake.

Subsection M261Bd, Anderson Marsh area — *James R. Nelson*

Vegetation. The predominant natural plant community is Blue oak series. Needlegrass grasslands, Valley oak series, Riparian habitats, and Emergent aquatic communities are common on alluvium and basin-fill around Clear Lake.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Chamise series, Chamise - wedgeleaf ceanothus series, Scrub oak series.

Forests and woodlands: Blue oak series, California buckeye series, Foothill pine series, Interior live oak series, Knobcone pine series, Valley oak series.

Climate. The mean annual precipitation is about 20 to 40 inches. Most of the precipitation is rain, but some is snow. Mean annual temperature is about 50° to 56° F. The mean freeze-free period is about 150 to 200 days.

Surface Water. Runoff from hills and the Plio-Pleistocene sedimentary terrain is rapid and all but the larger streams are dry through most of the summer. Runoff is stored in and around Clear Lake and the lake level rises when runoff from the surrounding hills and mountains is more rapid than drainage from the Lake. There is some hydrothermal activity and accumulation of minerals from it, as in and around Borax Lake.

Subsection M261Be Konocti Flows

This subsection is the volcanic terrain around Mt. Konocti and southeast from it. It has a hot, subhumid to humid climate. MLRA 15d.

Lithology and Stratigraphy. This subsection is dominated by silicic Quaternary volcanic rocks. The flows range from basalt or andesite to rhyolite, with the latter most prevalent, and there are interbedded pyroclastics.

Geomorphology. There are a few steep composite volcanic cone-shaped mountains, such as Mt. Konocti and Mt. Hannan, but most of the topography is gently sloping to moderately steep, somewhat chaotic terrain with a poorly integrated drainage system. The elevation range is from about 1300 feet up to 4722 feet on Cobb Mountain. Volcanic processes and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Ultic and Mollic Haploxeralfs and lesser amounts of Palexeralfs and Lithic Haploxerolls. The soils are generally leached free of carbonates. Soil temperature regimes are mostly thermic, but are mesic on some north-facing slopes and at higher elevation. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Chamise series on shallow soils; Mixed conifer series on moderately deep to deep soils with mesic soil moisture regimes; and Blue oak series, Mixed scrub oak series, and various other chaparral shrublands in other areas.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Chamise series, Chamise - wedgeleaf ceanothus series, Scrub oak series.

Forests and woodlands: Blue oak series, Douglas-fir series, Foothill pine series, Interior live oak series, Knobcone pine series, McNab cypress series, Ponderosa pine series, Sargent cypress series.

Climate. Mean annual precipitation is about 30 to 80 inches. Most of the precipitation is rain at lower and snow at higher elevation. Mean annual temperature is about 45° to 56° F. The mean freeze-free period is about 125 to 200 days.

Surface Water. Runoff is rapid and the streams are dry through most of the summer. There are many small

Subsection M261Be, Mount Konocti area — *Robert Ettner* areas with closed drainage basins, and some of them contain small Lakes up to the size of Thurston Lake, which is the largest natural lake in the subsection. There is some hydrothermal activity and accumulation of minerals from it.

Subsection M261Bf Ultrabasic Complex

The distinctive feature of this subsection is a complex pattern of Mesozoic sedimentary, metasedimentary, metavolcanic, and ultramafic rocks. It has a hot, subhumid to humid climate. MLRA 15d.

Lithology and Stratigraphy. This subsection contains Jurassic and Cretaceous Franciscan rocks of the Central and Eastern Belts, including much ultramafic rock, and Cretaceous sedimentary rocks of the Great Valley Sequence. There are large areas of late Quaternary alluvium in Coyote, Long, and Pope Valleys, but they are only minor parts of the subsection.

Geomorphology. This is a subsection of north-northwest to northwest trending mountains that generally have rounded summits and steep sides. Most of the canyons are narrow, but some have broad alluvial plains. The elevation range is from about 300 feet up to 3196 feet on Brushy Skyhigh. Mass wasting by flow and sliding, and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly serpentinitic Lithic Argixerolls and Haploxerolls and nonserpentinitc Dystric Lithic Xerochrepts and Typic and Mollic Haploxeralfs. The soils are generally leached free of carbonates. Soil temperature regimes are mostly thermic, but are mesic on some north-facing slopes and at higher elevation. Soil moisture regimes are xeric. There are no extensive surfaces old enough to have Palexeralfs.

Vegetation. The predominant natural plant communities are Leather oak series on serpentinitic soils, Chamise series on shallow nonserpentinitic soils, Mixed conifer series on deep soils with mesic temperature regimes, and Blue oak series on other soils. There is Coast live oak series on many north-facing slopes.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Chamise series, Chamise - wedgeleaf ceanothus series, Leather oak series, Scrub oak series, Whiteleaf manzanita series.

Forests and woodlands: Birchleaf mountain-mahogany series, Blue oak series, California bay series, Coast live oak series, Foothill pine series, Interior live oak series, Knobcone pine series, McNab cypress series, Sargent cypress series.

Climate. Mean annual precipitation is about 30 to 60 inches. Most of the precipitation is rain at lower and snow at higher elevation. Mean annual temperature is about 50° to 60° F. The mean freeze-free period is in the range from 150 to 250 days.

Surface Water. Runoff is rapid and all but the larger streams are dry through most of the summer. Natural lakes are absent.

CHAPTER 7

Section M261C Northern California Interior Coast Ranges

This section is the southeastern edge of the northern California Coast Ranges mountains, south of Cache Creek, and hills and terraces along the west side and north end of the Sacramento Valley. It is in MLRAs 15 and 17.

Geomorphology. Parallel ranges, folded, faulted and metamorhosed strata; rounded crests of subequal height. Coast Ranges Geomorphic province.

Lithology. Late Mesozoic shelf and slope sedimentary deposits.

Soil Taxa. Alfisols, Inceptisols, Mollisols and Vertisols in combination with thermic soil temperature regime and xeric soil moisture regime.

Vegetation. Predominant potential natural communities include the Blue Oak series, Chamise series, Purple needlegrass series and Foothill pine series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Cheatgrass series, Eucalyptus series, Tamarisk series.
>
> *Series that can occur in all subsections, but are not extensive*: Bulrush series, Bulrush - cattail series, Cattail series, Creeping ryegrass series, Duckweed series, Mosquito fern series, Nodding needlegrass series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Purple needlegrass series. Saltgrass series, Sedge series, Spikerush series.
>
> *Series restricted to riparian settings*: Arroyo willow series, Black willow series, Buttonbush series, Fremont cottonwood series, Mixed willow series, Mulefat series, Narrowleaf willow series, Pacific willow series, Red willow series, White alder series.

Fauna. Mammals include mule deer, black-tailed deer, coyotes, ground squirrels, cottontails, jack rabbits and kangaroo rats. Birds include turkey vultures, eagles, hawks, owls, quail, mourning dove, mockingbird, scrub jay, western meadow lark, finches and sparrows.

Elevation. 200 to 3000 feet.

Precipitation. 15 to 40 inches.

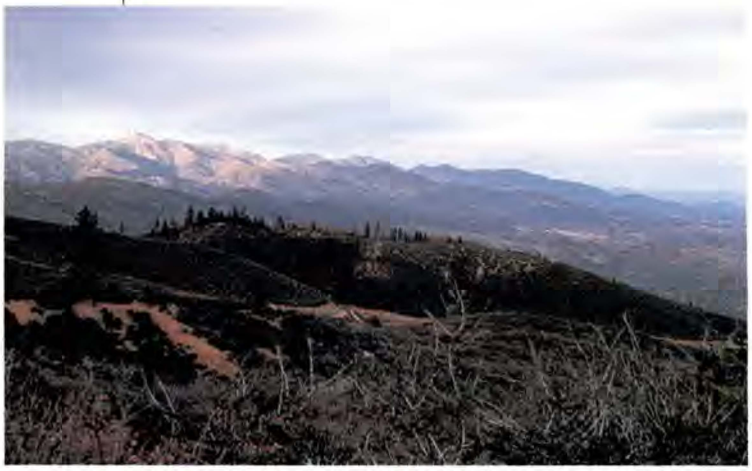
Temperature. 55° to 62°F.

Growing Season. 150 to 250 days.

Surface Water Characteristics. Many rapid perennial or intermittent streams in deeply incised canyons with weak bedrock channels flowing easterly to the Sacramento River. Reservoirs for irrigation water and flood control are common.

Disturbance Regimes.
Fire: Fires are low, moderate and high intensity surface or stand replacing fires.

Land Use. Composition and successional sequence of some communities has changed because of plant and



Section M261C, looking north from Cottonwood Creek area — *Robert Ettner* animal species introduced between the mid 1800's and early 1900's related to grazing and agriculture.

Cultural Ecology. Humans have been utilizing the interior Coast Range foothills for 8,000 to 9,000 years, and have been an integral part of the ecology for 3,000 to 5,000 years. Historically, ranching and agriculture provided the primary Euroamerican livelihood. Contemporary attitudes and beliefs are dichotomized between emphasis on amenity/newcomer and commodity/long-time resident values, with all overlain by a rural lifestyle. Contemporary economic pursuits include government employment, agriculture, and recreation.

Subsections. The Northern California Interior Coast Ranges section is divided into 3 subsections.

Subsection M261Ca Western Foothills

This subsection includes Blue Ridge in the northern California Coast Ranges and steep hills east of Blue Ridge and east of the Stony Creek fault. It extends north to the Klamath Mountains. The climate is hot and subhumid. MLRAs 15d and 15e.

Lithology and Stratigraphy. This subsection contains Jurassic and Cretaceous marine sedimentary rocks of the Great Valley Sequence. They are mostly sandstone, shale, and conglomerate that are tilted monoclinally eastward toward the center of the Great Valley.

Geomorphology. Blue Ridge, in the southeast margin of the northern California Coast Ranges mountains, trends north-northwest. The steep hills east of the mountains are elongated parallel to the edge of the Great Valley. They resemble hogbacks along the west edge of the Valley, but do not have such distinct forms at the north end of the Valley. The elevation range is from about 300 feet up to 3057 feet on Berryessa Peak. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic Xerochrepts, Typic Haploxeralfs, Xerolls, and Chromoxererts. The soils are generally, but not all, leached free of carbonates. Few surfaces are old enough, because of active erosion, to have Palexeralfs. Soil temperature regimes are predominantly thermic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities include Chamise series and Blue oak series. Chamise series is most prevalent on steep slopes with shallow or rocky soils. Needlegrass grasslands predominate on some Vertisols.

Characteristic series by lifeform include:
Grasslands: California annual grassland series.
Shrublands: Chamise series, Chamise - wedgeleaf ceanothus series, Scrub oak series, Wedgeleaf ceanothus series, Whiteleaf manzanita series.
Forests and woodlands: Birchleaf mountain-mahogany series, Blue oak series, California buckeye series, Foothill pine series, Interior live oak series.

Subsection M261Ca, South Fork of Elk Creek area — *Robert Ettner*

Subsection M261Cb, Thomes Creek area entering Sacramento Valley — *Robert Ettner*

Climate. The mean annual precipitation is about 25 to 40 inches; most of it is rain. Mean annual temperature is about 55° to 62° F. The mean freeze-free period is from 150 to 250 days.

Surface Water. Runoff is rapid and all but the larger streams are dry through most of the summer. There are no natural lakes, but there are a few reservoirs.

Subsection M261Cb Tehama Terraces

This subsection is a dissected plain between the hills to the west and the western margin of the Great Valley. It extends from Stony Creek north to the Klamath Mountains. The climate is hot and subhumid. MLRAs 15d and 17d.

Lithology and Stratigraphy. This subsection contains nonmarine Pliocene sandstones and conglomerates that are only slightly consolidated rocks, and unconsolidated Quaternary alluvium.

Geomorphology. This subsection is on a plain of Pliocene and Quaternary fluvial surfaces that are highly dissected by streams draining toward the Sacramento River. The drainage patterns are dendritic, branching from streams that drain toward the Sacramento river. Slopes range from nearly level to very gentle on remnants of depositional surfaces to moderately steep to steep in ravines. The elevation is about 200 to 1000 feet. Fluvial erosion is the main geomorphic process; mass wasting is active on steep ravine slopes.

Soils. The soils are mostly Typic, Mollic, and Ultic Palexeralfs on remnants of alluvial plain surfaces and Typic and Ultic Haploxeralfs on erosional slopes below the older surfaces. The soils are generally, but not all, leached free of carbonates. Some of the older soils have claypan (Palexeralfs) or duripan (Durixeralfs) subsoils. Soil temperature regimes are thermic and soil moisture regimes are xeric.

Vegetation. The predominant natural plant community is Blue oak series. Needlegrass grasslands predominate on some fine-textured Alfisols, and Northern claypan vernal pools are common.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Vernal pools: Northern claypan and hardpan vernal pools.

Shrublands: Chamise series, Chamise - wedgeleaf ceanothus series.

Forests and woodlands: Blue oak series, Foothill pine series.

Climate. The mean annual precipitation is about 20 to 40 inches; most of the precipitation is rain. Mean annual temperature is about 60° to 62° F. The mean freeze-free period is from 175 to 250 days.

Surface Water. Runoff is rapid and all but the larger streams are dry through most of the summer. Vernal pools are common in areas with claypans or duripans. There are no natural lakes in the area.

Subsection M261Cc Dunnigan Hills

This subsection comprises Dunnigan Hills and the low hills that extend northerly along the western edge of the Sacramento Valley to just north of Nye Creek. MLRAs 15e and 17e.

Lithology and Stratigraphy. This subsection contains predominantly nonmarine Pliocene mudstones, sandstones and conglomerates that are only slightly consolidated rocks. There are small areas of Pleistocene nonmarine deposits.

Geomorphology. Pliocene and Quaternary fluvial surfaces are highly dissected by streams draining toward the Sacramento River. Drainage patterns are dendritic, branching from streams that drain toward the Sacramento River. The Dunnigan Hills are almost completely dissected, leaving very little of the Pliocene depositional surface. They are well rounded hills with moderately steep to steep sides. The elevation range is about 200 to 1500 feet. Fluvial erosion is the main geomorphic process; mass wasting is important on moderately steep slopes with Vertisols and on steep slopes.

Soils. The soils are mostly Entic and Typic Chromoxererts. Palexeralfs predominate on undissected terrace surfaces. Other common soils are Lithic and Calcixerollic Xerochrepts, Haploxeralfs, and Argixerolls. Calcium carbonate accumulations are common in subsoils. Soil temperature regimes are thermic and soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Needlegrass grasslands. Blue oak series is present, but not common, on soils other than Vertisols.

Characteristic series by lifeform include:

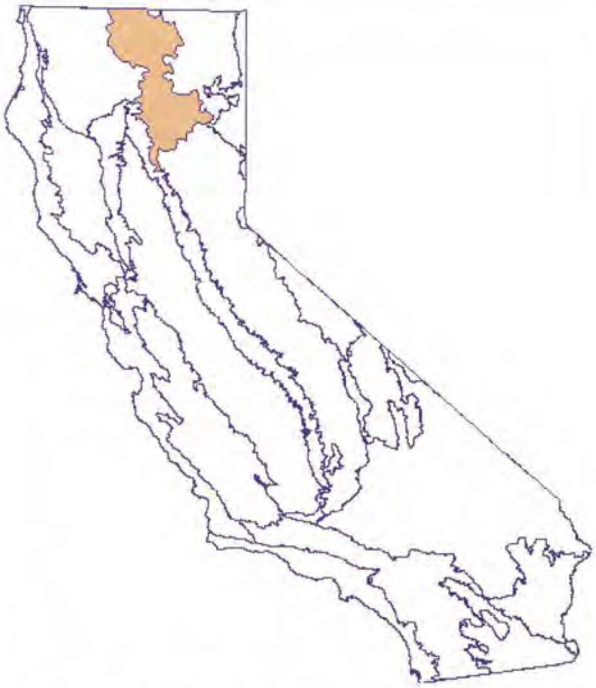
Grasslands: California annual grassland series.

Forests and woodlands: Blue oak series.

Climate. The mean annual precipitation is about 15 to 25 inches; most of it is rain. Mean annual temperature is about 60° to 62° F. The mean freeze-free period is from 200 to 250 days.

Surface Water. Runoff is rapid and all but the larger streams are dry through most of the summer. There are no natural lakes in the area.

CHAPTER 8



Section M261D Southern Cascades

This section comprises the southern Cascade Ranges. The crest of the mountain chain is aligned toward the north-northwest between the Sierra Nevada and Mt. Shasta and toward the north from Mt. Shasta northward. MLRAs 5, 21, and 22.

Geomorphology. Volcanic mountains variously eroded; no distinct range. Cascade Ranges geomorphic province.

Lithology. Cenozoic volcanic rocks.

Soil Taxa. Alfisols, Andisols, Aridisols, Entisols, Inceptisols, Mollisols, Ultisols and Vertisols in combination with mesic, frigid and cryic soil temperature regimes and xeric, aridic and aquic soil moisture regimes.

Vegetation. Predominant potential natural communities include the Ponderosa pine series, Big sagebrush series, Idaho fescue series, Western juniper series, Mixed conifer series, white fir series, red fir series and Lodgepole pine series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not placed in subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Broom series, California annual grassland series, Cheatgrass series, Introduced perennial grassland series, Kentucky bluegrass series, Tamarisk series.
>
> *Series that can occur in all subsections, but are not extensive*: Aspen series, Bulrush series, Bulrush - cattail series, Bur-reed series, Common reed series, Cattail series, Creeping ryegrass series, Ditch-grass series, Duckweed series, Holodiscus series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Quillwort series, Saltgrass series, Sedge series, Spikerush series, Tufted hairgrass series, Yellow pond-lily series.
>
> *Series restricted to riparian settings*: Arroyo willow series, Black cottonwood series, Black willow series, Mixed willow series, Montane wetland shrub habitat, Mountain alder series, Narrowleaf willow series, Pacific willow series, Red willow series, Water birch series.

Fauna. Mammals include black-tail and mule deer, mountain lion, coyote, bobcat, yellow-bellied marmot, marten, fisher, Sierra Nevada red fox, wolverine and porcupine. Birds include eagles, hawks, owls, woodpeckers, falcons, osprey, quail, northern goshawk and blue grouse. Species of concern include the California and northern spotted owl.

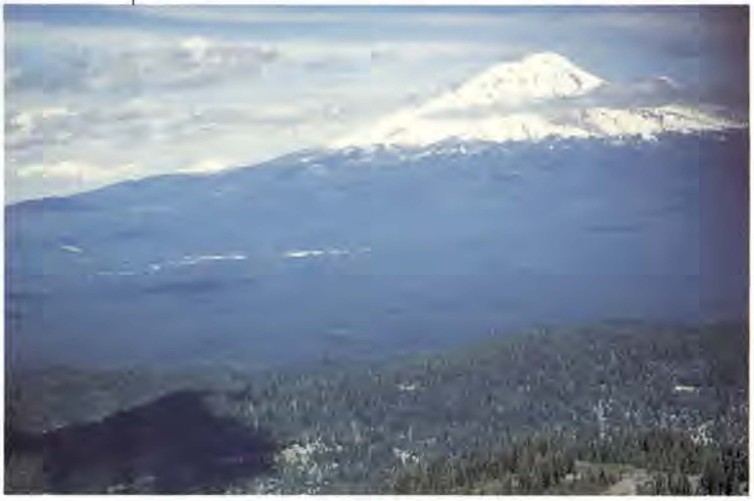
Elevation. 2,000 to 14,000 feet.

Precipitation. 8 to 80 inches.

Temperature. 30° to 58°F.

Growing Season. 25 to 175 days

Surface Water Characteristics. Common slow and moderately rapid rivers and streams. Rivers flow in alluvial or weak bedrock channels westerly to the Klamath and Sacramento Rivers, and easterly to basins in the Modoc Plateau section.



Section M261D, Mt. Shasta area — *Scott Miles*

Disturbance Regimes.

Fire: At lower and mid-elevations, historic occurrence has changed from frequent, low intensity, surface fires to infrequent, high intensity, stand replacing fires. At higher elevations, historic occurrence has changed from infrequent, low and moderate intensity surface fires to infrequent, low, moderate and high intensity surface or stand replacing fires.

Climate: Wide fluctuations in precipitation and temperature for periods of years result in significant or catastrophic changes in biological communities.

Volcanic Activity: Contains locations with eruptive activity (lava flows and ash fall) within the past 200 years.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to mining, grazing, forestry and recreational activities. Expanding foothill communities are scattered throughout the section.

Cultural Ecology. Humans have been utilizing the Cascades for about 8,000 years, and have been an integral part of its ecology for 2,000 to 3,000 years. The 14,000 foot volcano of Mt. Shasta dominates much of the landscape, and is a traditional cultural property of vital significance to five Native American groups, and of symbolic importance to Euroamericans as well. The timber industry played an important role historically; railroad logging systems spread throughout timbered areas. Contemporary attitudes and beliefs tend to be dominated by commodity oriented long-time resident values and a rural lifestyle. The economy is dominated by government employment, but the timber industry, recreation, and ranching are also important.

Subsections. The Southern Cascades section is divided into 13 subsections.

Subsection M261Da
Old Cascades

This subsection corresponds to the area of middle Tertiary volcanic rocks north of Mt. Shasta that geologists refer to as the Western Cascades. The climate is temperate and semi-arid to subhumid. MLRAs 5d and 21e.

Lithology. Eocene and Miocene andesite flows of the Western Cascades dominate this subsection. Quaternary alluvial and lacustrine basin-fill has accumulated in some areas.

Geomorphology. Steep mountain to moderately steep foothill slopes predominate in this subsection. The elevation range is from 2200 feet along the Klamath River up to about 5200 feet. Mass wasting and fluvial erosion are the main geomorphic processes, with fluvial and lacustrine deposition in Grass Lake.

Soils. Soils are mostly Andic Xerumbrepts, Lithic Xerorthents, Mollic Haploxeralfs, Vertic Argixerolls, and Leptic Haploxererts. The soils are well drained, except for poorly drained soils in basins. Soil temperature regimes are mesic. Soil moisture regimes are xeric, with some aquic in basins.

Vegetation. The predominant natural plant communities are Big sagebrush series and Oregon white oak series, with the latter most extensive north of the Klamath River and on north-facing slopes south of the Klamath River. Ponderosa pine series and Mixed conifer series occur on north-facing slopes at higher elevations. Wedgeleaf ceanothus series and Native grassland communities are common on south-facing slopes at lower elevations.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, California oatgrass series, Idaho fescue series, Nebraska sedge series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Bush chinquapin series, Deerbrush series, Greenleaf manzanita series, Rubber rabbitbrush series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Douglas-fir - ponderosa pine series, Oregon white oak series, Ponderosa pine series.

Climate. The mean annual precipitation is about 15 to 25 inches. Much of the precipitation is snow. Mean annual temperature is about 45° to 52° F. The mean freeze-free period is about 75 to 150 days.

Surface Water. Runoff is rapid, except in basins. Water drains to the Klamath River, which crosses the subsection, or to tributaries of the Klamath River. Streams other than the Klamath and Little Shasta Rivers are dry though most of each summer.

Subsection M261Db
Shasta Valley

This subsection corresponds to the lower part of Shasta Valley. It is between the Southern Cascade Mountains on the east and the Klamath Mountains on the west. The climate is temperate and semi-arid to subhumid. MLRA 21e.

Lithology and Stratigraphy. Quaternary alluvium dominates this subsection. There are a few small hills of Tertiary volcanic rocks protruding through the alluvium in the northeast and east parts of the subsection, and many small hills of Quaternary debris avalanche flow deposits on the southwest.

Geomorphology. The main landforms are nearly level to moderately sloping floodplains, terraces, and alluvial fans. There are many small, moderately sloping to moderately steep hills on the alluvial plain. The elevation range is about 2600 to 3000 feet. Fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. Soils are mostly Typic Durixeralfs and Palexerollic Durixerolls, with Fluvaquentic Haploxerolls, Fluvaquentic Endoaquolls, and Aquic Durorthids on floodplains and terraces. The soils are mostly well drained on alluvial fans and somewhat poorly to poorly drained on floodplains and terraces. Soil temperature regimes are mesic. Soil moisture regimes are aridic, xeric, and aquic.

Vegetation. The predominant natural plant communities are Big sagebrush series, Western juniper series, and Sedge meadow communities.

Characteristic series by lifeform include:
Grasslands: Beaked sedge series, California oatgrass series, Idaho fescue series, Nebraska sedge series, Sedge series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Low sagebrush series, Rubber rabbitbrush series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Western juniper series.

Climate. The mean annual precipitation is about 8 to 18 inches. Much of the precipitation is snow. Mean annual temperature is about 50° to 52° F. The mean freeze-free period is about 125 to 150 days.

Surface Water. Runoff is moderately rapid from alluvial fans and slow to very slow from floodplains and terraces. Water drains to the Little Shasta and Shasta Rivers, which are perennial streams through the subsection.

Subsection M261Dc Upper Shasta Valley

This subsection corresponds to the upper part of Shasta Valley. It is just northwest of Mt. Shasta. The climate is temperate and semi-arid to subhumid. MLRA 21e.

Lithology and Stratigraphy. Quaternary debris avalanche flow deposits and alluvium dominate the western part and Quaternary basalt flows dominate the eastern part of this subsection. There is some Pleistocene glacial till and outwash from Mt. Shasta on the southeastern edge of the subsection.

Geomorphology. The main landforms are undulating lava flows on the east and moderately steep to steep hills consisting of large colluvial blocks of rock on the west with very gently to moderately sloping pediments and alluvial fans on finer colluvial debris between hills. Colluvial blocks in landforms on the west side of the subsection slid or flowed off of a predecessor of Mt. Shasta about 0.3 million years ago, coming to rest among disrupted alluvial deposits. There are many closed basins among the hills of the debris avalanche flow deposits. Floodplains and terraces are most extensive along Parks and Willow Creeks and alluvial fans are most extensive on the southwest edge of the subsection, adjacent to the Klamath Mountains. The elevation range is about 2600 to 4000 feet. Volcanic lava flow, mass wasting, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Subsection M261Dc, Shasta Valley area, north of Mt. Shasta — *Julie Nelson*

Soils. Soils are mostly rocky Typic Durixeralfs on lava flows; Typic Xeropsamments on glacial outwash and alluvial fans adjacent to Mt. Shasta; rocky Lithic Haploxerolls on debris flow blocks; Mollic Haploxeralfs, Vertic Argixerolls, and Leptic Haploxererts on finer debris flow deposits, pediments, and alluvial fans around the debris flow blocks; Xeric Endoaquerts and Aquic Durorthids in basins among debris flow deposits; and Typic Xerochrepts and Pachic Argixerolls on alluvial fans adjacent to the Klamath Mountains. Fluvaquentic Haploxerolls and Fluvaquentic Endoaquolls occur on floodplains along Parks and Willow Creeks and Palexerollic Durixerolls occur on terraces with mima mounds near Parks Creek. The soils are mostly well drained, except somewhat poorly to poorly drained soils on floodplains and in basins. Soil temperature regimes are mesic. Soil moisture regimes are aridic, xeric, and aquic.

Vegetation. The predominant natural plant communities are Big sagebrush series and Native grassland communities, with Western juniper series on the east, and Sedge meadow communities on floodplains and in basins. Low sagebrush series occurs on shallow soils with silica hardpans.

Characteristic series by lifeform include:
Grasslands: Beaked sedge series, California oatgrass series, Idaho fescue series, Nebraska sedge series, Sedge series, Tufted hairgrass series.
Shrublands: Big sagebrush series, Low sagebrush series, Rubber rabbitbrush series, Wedgeleaf ceanothus series.
Forests and woodlands: Black oak series, Ponderosa pine series, Western juniper series.

Climate. The mean annual precipitation is about 12 to 25 inches. Much of the precipitation is snow. Mean annual temperature is about 48° to 52° F. The mean freeze-free period is about 100 to 150 days.

Surface Water. Runoff is rapid from hills and slow from alluvial fans and floodplains. The drainage systems are poorly integrated on lava flows on the east and on debris avalanche flow deposits on the west. There are few streams, especially on the lava flows. The Shasta River and Parks and Willow Creeks flow through the subsection. Ephemerally ponding occurs in closed basins of the debris avalanche flow terrain.

Subsection M261Dd Blacks Mountain - Susanville Peak

This subsection is on a mountain studded volcanic plateau comprising the southeastern part of the Southern Cascade Ranges. The climate is temperate to cold and subhumid. MLRA 22e.

Lithology and Stratigraphy. Quaternary basalt flows dominate this subsection, except the southeastern corner, which is dominated by Pliocene andesite flows. Also, there is an inlier of Mesozoic granitic rock in the southeastern corner of the subsection. Recent basalt covers Crater Mountain. Fluvial and lacustrine deposits occur in basins that are less than a few thousand acres each.

Subsection M261Dd, northern part of upper Susan River area — *Earl Alexander*

Geomorphology. Moderately steep to steep shield and composite volcanoes rise above an undulating lava plateau in this subsection. Most of the major faults are aligned toward the north or the northwest. A few cinder cones are scattered across the subsection. Alluvial and lacustrine basin-fill has accumulated in small depressions on lava flows and larger depressions between lava flows. Eolian sand has accumulated on the northeast sides of some of the larger basins. The elevation range is from about 5000 feet up to 7687 feet on Antelope Mountain. Volcanic, tectonic, mass wasting, and fluvial erosion processes predominate, with fluvial and lacustrine deposition in depressions.

Soils. Soils from lower to higher elevations on basalt and andesite are mostly Ultic Argixerolls on undulating plateau, Andic Haploxeralfs and Andic Argixerolls on lower mountain slopes, and Andic Xerumbrepts on higher mountain slopes. Haploxerands occur in cinder deposits. Soils in basins include Dystric Fluventic Xerochrepts, Mollic Haploxeralfs, Aquic Haploxeralfs, Aquic Haploxererts, and Xeric Endoaquerts. The soils are well drained, except somewhat poorly to poorly drained soils in basins. Soil temperature regimes are mostly frigid, with some mesic at lower elevations. Soil moisture regimes are mostly xeric, with some aquic in basins.

Vegetation. The predominant natural plant communities from hotter and drier to wetter and cooler sites are Jeffrey pine - ponderosa pine series, White fir series, and Red fir series. Low sagebrush series occurs on shallow soils and soils with dense subsoils. Curlleaf mountain-mahogany series occurs on very rocky soils. Silver sagebrush series occurs in some drainage-ways and on the margins of some basins. Native grassland communities occur in dry basins and Emergent aquatic communities, including Spikerush series, occur in wet basins.

Characteristic series by lifeform include:
Grasslands: Beaked sedge series, Idaho fescue series, Nebraska sedge series, Sedge series, Spikerush series, Tufted hairgrass series.
Shrublands: Big sagebrush series, Bitterbrush series, Curlleaf mountain-mahogany series, Greenleaf manzanita series, Low sagebrush series, Rubber rabbitbrush series, proposed Silver sagebrush series, Wedgeleaf ceanothus series.
Forests and woodlands: Baker cypress stands, Black oak series, Jeffrey pine series, Jeffrey pine - ponderosa pine series, Ponderosa pine series, White fir series, Red fir series, Washoe pine series.

Climate. The mean annual precipitation is about 20 to 45 inches. Much of the precipitation is snow. Mean annual temperature is about 40° to 48° F. The mean freeze-free period is about 50 to 100 days.

Surface Water. Runoff is rapid to moderate on lava flows. Water drains down through joints in the basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. Water that does flow overland drains to ephemerally ponded closed basins, to the Susan River, which is a perennial stream that flows to Honey Lake, or to Pine Creek, which is an intermittent stream that flows to Eagle Lake.

Subsection M261De
Butte Valley

This subsection corresponds to an intermountain valley floor on the eastern side of the Southern Cascade Ranges. It is northwest of the Medicine Lake Highlands. The climate is temperate and semi-arid. MLRAs 21e and 21f.

Lithology and Stratigraphy. Quaternary alluvial and lacustrine deposits dominate this subsection. Eolian deposits occur on the east side of the valley.

Geomorphology. Nearly level basin floor, largely a lake plain, dominates this subsection. There are very gently to moderately sloping alluvial fans around the margins and dunes on the east side of the basin. Small closed depressions occur among the dunes. The elevation range is about 4230 to 4300 feet. Fluvial, lacustrine, eolian, and freeze-thaw processes predominate.

Soils. Soils are mostly Haplic and Haploxeralfic Natrargids, and Aridic Durixerolls. Torripsamments occur on dunes. The soils are mostly well drained. Soil temperature regimes are mesic. Soil moisture regimes are mostly aridic. Some soils are poorly drained and have been artificially drained.

Subsection M261De, Butte Valley area — *Joe Jahnke*

Vegetation. The predominant natural plant communities are Native grassland communities, Big sagebrush series, Silver sagebrush series, and, on the dunes, Western juniper series.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, Idaho fescue series, Nebraska sedge series, Sedge series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Bitterbrush series, Low sagebrush series, Rubber rabbitbrush series.

Forests and woodlands: Western juniper series.

Climate. The mean annual precipitation is about 10 to 18 inches. Much of the precipitation is snow. Mean annual temperature is about 44° to 45° F. The mean freeze-free period is about 75 to 100 days.

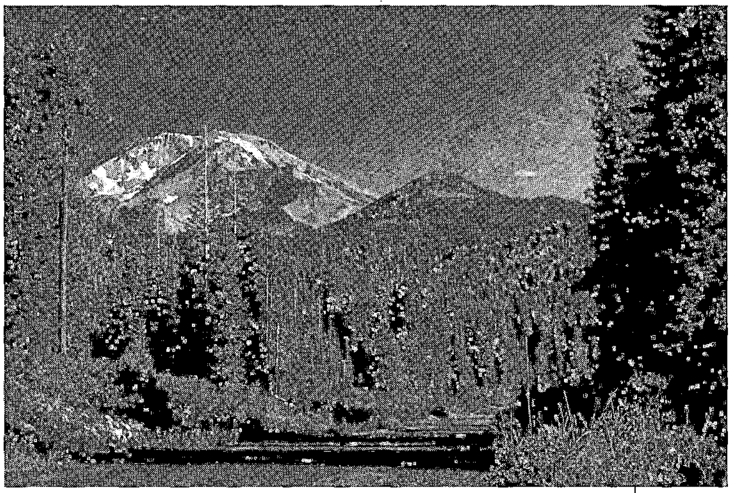
Surface Water. All drainage is internal, to Meiss Lake on the west side of the valley. Most water entering the basin flows in from the High Cascades on the west.

Subsection M261Df
High Cascades

This subsection comprises an area of late Tertiary and Quaternary volcanic rocks that geologists refer to as the High Cascades. The subsection is on the higher parts of the Southern Cascade Ranges from Mt. Shasta northward into Oregon. Also, it extends southeastward to Bear Mountain. The climate is temperate to very cold and subhumid to humid. MLRA 22d.

Lithology and Stratigraphy. Pliocene and Pleistocene basalt and andesite flows dominate this subsection. Recent basalt flows and thick pyroclastic deposits are much less extensive, although volcanic ash has been scattered across entire area. Quaternary glacial till, outwash, and debris flow deposits are extensive on Mt. Shasta and around the foot of the mountain, although debris flow deposits are more widely distributed.

Geomorphology. Steep to moderately steep composite volcanoes dominate this subsection. Many of the volcanoes have cinder cones and plug domes on them. Mt. Shasta is an active stratovolcano that has five main glaciers on it. Pleistocene cirques and moraines are extensive on Mt. Shasta, particularly on the older south side of the mountain. Glacial outwash is extensive around the base of Mt. Shasta, and well beyond the mountain on the northeast side. The elevation range is from about 3000 feet on the southwest side of Mt. Shasta up to 14,162 feet on its summit. Volcanic, mass wasting, fluvial, and glacial processes predominate.



Subsection M261Df, Mt. Shasta from McKenzie Butte area — *Robert Ettner*

Soils. Soils are mostly Dystric Xerorthents, Andic Xerumbrepts, Typic and Umbric Haploxerands, Pachic Ultic Argixerolls, Typic Haplocryands, and, on Mt. Shasta, Typic Vitricryands. Lithic Argixerolls occur on Recent basalt. Rock and rubble land dominate the upper slopes of Mt. Shasta and the summits of Whaleback, Goosenest, and Ash Creek Butte. On lower slopes of the southwest side of Mt. Shasta, soils are mostly ashy Typic Xeropsamments and Typic Vitrixerands. The soils are well drained. Soil temperature regimes are mostly frigid, with mesic on the lower southwest side of Mt. Shasta and cryic on the upper part of Mt. Shasta and the summits of other high mountains. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities, from lower to higher elevations, are Mixed conifer series, White fir series, Red fir series, Mountain hemlock series, and Whitebark pine series. Lodgepole pine series occurs near timberline and in areas where cold air collects. Barren land and Alpine habitat predominate above about 8000 to 8500 feet on Mt. Shasta and Whaleback.

Characteristic series by lifeform include:

Grasslands: Alpine habitat, Beaked sedge series, Green fescue series, Nebraska sedge series, Rocky Mountain sedge series, Tufted hairgrass series.

Shrublands: Bush chinquapin series, Greenleaf manzanita series, Huckleberry oak series, Mountain heather - bilberry series, Mountain whitethorn series, Parry rabbitbrush series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Douglas-fir series, Incense-cedar series, Lodgepole pine series, Mixed conifer series, Mixed subalpine forest series, Mountain hemlock series, Red fir series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 20 to 70 inches. Most of the precipitation is snow. Mean annual temperature ranges from less than 30° to about 50° F. The mean freeze-free period ranges from less than 25 days to about 150 days.

Surface Water. Runoff is rapid. Much of the water drains through the ground, contributing to springs around the bases of the mountains. Ultimately, water drains to the Sacramento River, the Klamath River, or closed basins on the east side of the subsection. Some of the larger streams, such as Horsethief, Mud, Ash and Butte Creeks, are perennial.

Subsection M261Dg McCloud Flat

This subsection is a volcanic plain that lies on the southeastern flank of Mt. Shasta. It is bordered on the south by the McCloud River. The climate is temperate and humid. MLRA 22c.

Lithology and Stratigraphy. Pliocene basalt flows dominate the subsection. They are deeply buried by Quaternary alluvium near the flanks of Mt. Shasta. The basalt flows are largely covered by alluvium in the middle of the subsection, and they are exposed near the McCloud River.

Geomorphology. The dominant landform is undulating basalt flows which have been faulted to form horsts and grabbens. Alluvial plains have formed in depressions in the grabbens. Gently sloping mudflow deposits, glacial deposits, and alluvial fans emanating from Mt. Shasta overlie the basalt flows on the west and northwest margins of the subsection. The center of the subsection is characterized by a terrain of small areas of alluvium with frequent basalt rock outcrops. The basalt flows are gradually more exposed closer to the McCloud River. The elevation range is 3000 to 4000 feet. Volcanic and fluvial processes predominate.

Soils. Soils on the rocky volcanic plateau are mostly Lithic Xerumbrepts, Umbric Vitrixerands, and Humic Haploxerands. Soils on alluvium in closed basins on the volcanic Plateau are mostly Vitrandic and Andeptic Xeropsamments, Typic and Umbric Vitrixerands, and Entic Xerumbrepts. Soils on alluvium and colluvium around the base of Mt. Shasta are mostly Andic Xerumbrepts and Typic and Humic Haploxerands. The soils are well drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are mostly Ponderosa pine series on the volcanic plateau and, from lower to higher elevations on alluvial fans and mudflows from Mt. Shasta, Ponderosa pine series, Mixed conifer series, and White fir series. Lodgepole pine series occurs along drainage-ways and cold air basins on the volcanic plateau.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, Idaho fescue series, Nebraska sedge series, Sedge series, Tufted hairgrass series.

Shrublands: Deerbrush series, Greenleaf manzanita series, Huckleberry oak series, Mountain whitethorn series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Douglas-fir series, Incense-cedar series, Lodgepole pine series, Knobcone pine series, Mixed conifer series, Ponderosa pine series, White fir series.

Climate. The mean annual precipitation is about 40 to 60 inches. Much of the precipitation is snow. Mean annual temperature is about 45° to 50° F. The mean freeze-free period is about 100 to 150 days.

Surface Water. Runoff is rapid. Water drains down through joints in basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. Some streams flowing from Mt. Shasta, such as Mud Creek and Ash Creek, are perennial. Ash Creek infiltrates into Ash Creek Sink. Mud Creek is tributary to the McCloud River.

Subsection M261Dh Medicine Lake Lava Flows

This subsection is a volcanic plateau surrounding the Medicine Lake Highlands on all but the west side, where it is bounded by the High Cascades. The climate is temperate to cold and semi-arid to subhumid. MLRA 22c.

Subsection M261Dh, view northward from Little Mt. Hoffman — *Robert Ettner*

Lithology and Stratigraphy. Pliocene, Pleistocene, and Recent basalt flows dominate this subsection. Much of the Recent basalt has flowed from the still active Medicine Lake volcano in the Medicine Lake Highlands and from fissures around the volcano. Pliocene nonmarine sedimentary rocks are common just south of the Lower Klamath Lake and Tule Lake basins. Recent cinders and ash are scattered across the subsection. Quaternary alluvium occurs in small basins between lava flows and in very small basins on flows.

Geomorphology. The dominant landform is an undulating basalt plain that is interrupted by many moderately steep to steep volcanic domes and cinder cones. Major faults are aligned toward the north or north-northwest. Much of the related horst and grabben pattern is buried by recent lava flows. The recent lava flows generally have rough, broken surfaces. The elevation range is from about 4100 to 6500 feet. Volcanic, tectonic, fluvial, and freeze-thaw processes predominate.

Soils. Soils are mostly Lithic, Typic, and Duric Vitritorrands; Lithic and Humic Haploxerands; and, in basins, Andic Xerumbrepts. Rock and rubbleland predominate on Recent lava flows. Soils on Pliocene sedimentary rocks are mostly Aridic Argixerolls and Pachic Haploxerolls. The soils are well drained. Soil temperature regimes are mesic, with some frigid. Soil moisture regimes are aridic and xeric.

Vegetation. The predominant natural plant communities are mostly Western Juniper series, Big sagebrush series, and Native grassland communities in drier areas and Ponderosa pine series in areas of higher precipitation. Curlleaf mountain-mahogany occurs on shallow and rocky soils. Mixed conifer series occurs in the southern part and Lodgepole pine series in the northern part of the subsection. Most of the Recent lava flows are barren, lacking vascular plants.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, Idaho fescue series, Nebraska sedge series, Sedge series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Bitterbrush series, Low sagebrush series, Rubber rabbitbrush series.

Forests and woodlands: Knobcone pine series, Ponderosa pine series, Western juniper series.

Climate. The mean annual precipitation is about 10 to 30 inches. Much of the precipitation is snow. Mean annual temperature is about 40° to 48° F. The mean freeze-free period is about 75 to about 125 days.

Surface Water. Runoff is moderately rapid. Water drains down through joints in basalt to the ground water reservoir, limiting overland flow of water and development of stream channels on the volcanic plateau. There are few streams and many small, closed basins in the subsection. Ephemeral ponding occurs in some of the basins that are in grabens.

Subsection M261Di
Medicine Lake Highlands

This subsection is a volcanic highland around the remnants of a very large shield volcano. The climate is cold and subhumid. MLRA 22c.

Lithology and Stratigraphy. Pliocene and Pleistocene basalt and andesite flows and Recent basalt, andesite, and rhyolite, including obsidian, flows and pyroclastic deposits dominate this subsection.

Geomorphology. The Medicine Lake Highlands are built of Pleistocene and Recent lava flows and pyroclastic deposits on a Pleistocene shield volcano. The center of the shield volcano collapsed and volcanoes around the rim of the crater have partially filled and obliterated it. Slopes range from steep on some volcanoes to gentle on basalt and andesite lava flows. The terrain is rough and chaotic on recent lava flows. There are many cinder cones in the subsection. Basin-fill has accumulated in the crater occupied by Medicine Lake. The elevation range is from about 4500 up to 7913 feet on Mt. Hoffman. Volcanic and fluvial processes predominate.

Soils. Soils are mostly Lithic and Vitrandic Xerorthents and Typic and Humic Haploxerands. Thaptic Vitrixerands occur in Recent pumice deposits. Rock and rubbleland predominate on many Recent lava flows. The soils are well drained. Soil temperature regimes are mostly frigid, with some cryic and mesic. Soil moisture regimes are xeric.

Subsection M261Di, view eastward from Little Mt. Hoffman — *Scott Miles*

Vegetation. The predominant natural plant communities are Red fir series and White fir series, and, in cold valleys and basins, Lodgepole pine series. Mountain hemlock series occurs at the higher elevations. Mixed conifer series and Ponderosa pine series occur at the lower elevations. Many Recent lava flows are barren, lacking vascular plants.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, Green fescue series, Idaho fescue series, Nebraska sedge series, Rocky Mountain sedge series, Sedge series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Bush chinquapin series, Greenleaf manzanita series, Mountain heather - bilberry series, Mountain whitethorn series, Parry rabbitbrush series, Rubber rabbitbrush series, Tobacco brush series.

Forests and woodlands: Black oak series, Knobcone pine series, Lodgepole pine series, Mixed subalpine forest series, Mountain hemlock series, Ponderosa pine series, Red fir series, Western White pine series, White fir series.

Climate. The mean annual precipitation is about 25 to 40 inches. Most of the precipitation is snow. Mean annual temperature is about 35° to 45° F. The mean freeze-free period is about 25 to 100 days.

Surface Water. Runoff is rapid. Water drains down through cinders, pumice, and joints in basalt to the ground water reservoir, limiting overland flow of water and development of stream channels on the volcanic plateau. There are few streams in the subsection, and they are ephemeral, flowing to closed basins. Medicine Lake is in the crater of ancient Mt. Hoffman.

Subsection M261Dj
Hat Creek Rim

This subsection corresponds to a relatively low and narrow part of the Southern Cascade Range from Hat Creek Rim and Hat Creek valley north to the Bear Creek area near Pondosa. The climate is temperate to cold and subhumid to humid. MLRA 22d.

Lithology and Stratigraphy. Miocene, Pliocene, and Pleistocene basalt and andesite lava flows dominate this subsection. Quaternary basalt lava flows occur on Cinder Cone, Cinder Butte, and the floor of Hat Creek Valley. Weakly consolidated Pliocene and Quaternary sedimentary deposits, including diatomite, occur along the Pit River in the vicinity of Lake Britton. Quaternary alluvial and lacustrine basin-fill has accumulated in some valleys.

Subsection M261Dj, Hat Creek lava flows, Mt. Lassen in background — *Scott Miles*

Geomorphology. Very gently to moderately sloping lava flows predominate, with steep risers between these lava flow surfaces and steep canyons cut through the flows. Slopes are very steep in the inner gorge of the Pit River and nearly level on basin floors such as those in Goose Valley, along Burney Creek, and on Cayton Flat. The terrain is rough and chaotic on recent lava flows. There are some cinder cones in the subsection, mostly in Hat Creek Valley, which is a graben, and near the plateau rim on the east side of the graben. The graben and most of the major faults are aligned toward the north-northwest. Some large landslides caused by failure of diatomaceous sediments occur on the north side of the Pit River. The elevation range is from about 2400 feet along the Pit River up to 5540 feet on Soldier Mountain and 5733 on Red Mountain. Tectonic, volcanic, and fluvial processes predominate. Mass wasting is common below the Hat Creek Rim, along the Soldier Mountain fault-line scarp, and along the Pit River.

Soils. Soils, from lower to higher elevations, are mostly Vitrandic Argixerolls, Vitrandic Palexeralfs, Andic Palehumults, Ultic Haploxerands, Humic Haploxerands, and Melanoxerands. Haploxeralfs, Haplohumults, and Haploxerands are common on steep slopes. Rock and rubbleland predominate on recent lava flows. Cumulic Humaquepts and Vertic Haplaquolls occur in basin floors. The soils are well drained, except poorly drained soils on basin floors. Soil temperature regimes are mostly mesic, with some frigid. Soil moisture regimes are xeric, except aquic on basin floors.

Vegetation. The predominant natural plant communities, from lower to higher elevations, are generally Oregon white oak series, Ponderosa pine series, Mixed conifer series, and White fir series. Birchleaf mountain-mahogany series and Wedgeleaf ceanothus series occur on shallow soils at lower elevations. Recent lava flows are barren or sparsely to densely vegetated by vascular plants, which includes Greenleaf manzanita series and some Curlleaf mountain-mahogany series. Western juniper series and Big sagebrush series occur in drier areas along the eastern edge of the subsection.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, Idaho fescue series, Nebraska sedge series, Rocky Mountain sedge series, Sedge series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Bitterbrush series, Bush chinquapin series, Deerbrush series, Greenleaf manzanita series, Huckleberry oak series, Mountain whitethorn series, Rubber rabbitbrush series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Birchleaf mountain-mahogany series, Black oak series, Blue oak series, Curlleaf mountain-mahogany series, Douglas-fir series, Incense-cedar series, Interior live oak series, Oregon white oak series, Ponderosa pine series, Mixed conifer series, Western juniper series, White fir series.

Climate. The mean annual precipitation is about 20 to 60 inches. Most of the precipitation is snow. Mean annual temperature is about 45° to 55° F. The mean freeze-free period is about 75 to 150 days.

Surface Water. Runoff is rapid, except on basin floors. Water drains down through joints in basalt on Recent lava flows, limiting overland flow of water and development of stream channels on these younger flows. Some larger streams, particularly Hat Creek, are perennial. Most of the smaller streams are ephemeral, being dry during summer. Streams flow to the Pit River or its tributaries, except at the northern end of the subsection which is in the McCloud River drainage system.

Subsection M261Dk Parker Mountain Flat

This subsection comprises a volcanic plateau north of the Klamath River and just west of the High Cascades. The climate is temperate and humid. MLRA 5d.

Lithology and Stratigraphy. Upper Miocene and Pliocene basalt and andesite lava flows and flow breccias dominate this subsection. Pliocene and Quaternary pyroclastic deposits and Quaternary basalt lava flows are less extensive.

Geomorphology. This subsection is on a rolling volcanic plateau with gentle to moderately steep slopes.

The elevation range is from about 3400 feet just above the canyon of the Klamath River up to 5112 feet on Grizzly Mountain and 5210 feet on Parker Mountain. Volcanic and fluvial erosion processes predominate.

Soils. Soils are mostly Lithic, Vertic, and Ultic Argixerolls at lower elevations and Ultic Haploxeralfs at higher elevations. Andic Xerumbrepts occur on north-facing slopes at higher elevations. Rubbleland is extensive. The soils are well drained. Soil temperature regimes are mostly mesic, with some frigid. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Wedgeleaf ceanothus and Native grassland communities on shallow and clayey soils, and Ponderosa pine series on Pachic Ultic Argixerolls at lower elevations, and Mixed conifer series on Ultic Haploxeralfs. Some Oregon white oak series occurs on north-facing slopes at lower elevations. White fir series occurs on north-facing slopes at higher elevations.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, California oatgrass series, Idaho fescue series, Nebraska sedge series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Low sagebrush series, Rubber rabbitbrush series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Douglas-fir series, Incense-cedar series, Ponderosa pine series, Mixed conifer series, Oregon white oak series, White fir series.

Climate. The mean annual precipitation is about 30 to 40 inches. Much of the precipitation is snow. Mean annual temperature is about 45° to 50° F. The mean freeze-free period is about 75 to 125 days.

Surface Water. Runoff is rapid. Most of the streams are ephemeral, being dry during summer. Streams flow to the Klamath River or its tributaries.

Subsection M261DI Shingletown - Paradise

This subsection comprises volcanic mountains and plateaus between the High Cascades and the lower part of the Tuscan volcanic plateau southwest of Lassen Peak. The climate is temperate and humid. MLRA 22c.

Lithology and Stratigraphy. Pliocene and Pleistocene basalt and andesite lava flows and andesitic lahars dominate this subsection. Rhyolite lava flows and silicic pyroclastic deposits are much less extensive. Pleistocene glacial outwash and Recent alluvium occupy stream valleys and basins.

Subsection M261Dl, Snow Mountain area southwest of Burney — *Robert Ettner*

Geomorphology. Steep mountains, moderately steep hills, and very gently to moderately sloping, deeply dissected plateaus are all major landscape components. There are few cinder cones. The elevation range is about 2000 to 5000 feet, and up to 5496 feet on Hatchet Mountain. Volcanic and fluvial processes predominate. Mass wasting is important on steep mountains and canyon sideslopes.

Soils. Soils are mostly Ultic Palexeralfs at lower elevations, Xeric Haplohumults at intermediate elevations, Andic Haplohumults at higher elevations, and Andic Xerumbrepts on late Quaternary lava flows, glacial outwash, and steep slopes. The soils are well drained. Soil temperature regimes are mostly mesic, with some frigid. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are, from lower to higher elevations, Ponderosa pine series, Mixed conifer series, and White fir series. Canyon live oak series occurs on very steep canyon sideslopes.

> **Characteristic series by lifeform include:**
> *Grasslands*: Beaked sedge series, California oatgrass series, Idaho fescue series, Nebraska sedge series, Tufted hairgrass series.
>
> *Shrublands*: Brewer oak series, Buttonbush series, Deerbrush series, Greenleaf manzanita series, Interior live oak shrub series, Mulefat series, Scrub oak series, Whiteleaf manzanita series.
>
> *Forests and woodlands*: Black oak series, Blue oak series, Canyon live oak series, Douglas-fir series, Foothill pine series, Incense-cedar series, Interior live oak series, Knobcone pine series, McNab cypress series, Oregon white oak series, Ponderosa pine series, Mixed conifer series, White alder series, White fir series, White oak series.

Climate. The mean annual precipitation is about 30 to 60 inches, but over 90 inches on Snow and Clover Mountains. Much of the precipitation is snow. Mean annual temperature is about 46° to 58° F. The mean freeze-free period is about 100 to 175 days.

Surface Water. Runoff is moderately rapid. Water drains down through joints in basalt on Recent lava flows, but the lahars are aquitards. The larger streams, including Cow Creek, Battle Creek, Paynes Creek, Antelope Creek, and Deer Creek, are perennial. Most of the smaller streams are ephemeral, being dry during summer. Streams flow to the Pit River or the Sacramento River.

Subsection M261Dm
Lassen - Almanor

This subsection comprises the High Cascades at the southern end of the Southern Cascade Ranges. The climate is cold to very cold and humid. MLRA 22d.

Lithology and Stratigraphy. Pliocene and Pleistocene basalt and andesite lava flows and pyroclastic deposits dominate this subsection. Rhyolite and dacite lava flows and andesitic lahars are less extensive. Pleistocene glacial till and outwash are extensive and Recent alluvial and lacustrine deposits occupy stream valleys and basins.

Geomorphology. Moderately steep to steep shield and composite volcanoes, plug domes, and cinder cones, surrounded by volcanic plateau, dominate the subsection. Cinder cones are most numerous north-northwest of Lassen Peak and on the northeastern part of the plateau east of Lassen Peak. Glacial ice covered the higher peaks and much of the plateau just east of Lassen Peak during the Pleistocene. Lassen Peak has been sufficiently active since the Recent Epoch to obliterate most of the glacial features on and immediately around it. Glacial deposits are most extensive on the southeast edge of the plateau east of Lassen Peak, where there has been less Recent volcanic activity. The elevation range is from about 4500 feet around Lake Almanor up to 10,457 feet on Lassen Peak. Volcanic, mass wasting, glacial, and fluvial processes predominate.

Soils. Soils are mostly Andic Xerumbrepts, Haploxerands, Typic Haplocryands, and Typic Vitrixerands. Ultic Argixerolls and Ultic Haploxeralfs predominate on uplands around Lake Almanor. Cumulic Humaquepts occur on wet floodplains and basin floors. The soils are well drained, except poorly drained soils on floodplains and in basins. Soil temperature regimes are mostly frigid and cryic. Soil moisture regimes are xeric, except aquic on floodplains and in basins.

Vegetation. The predominant natural plant communities are, from lower to higher elevations, White fir series, Red fir series, Mountain hemlock series, and Whitebark pine series. Jeffrey pine - ponderosa pine series is common east of Lassen Peak. Lodgepole pine series occurs in cold basins. Barren land and Alpine habitat occurs at higher elevations.

> **Characteristic series by lifeform include:**
> *Grasslands*: Alpine habitat, Beaked sedge series, Green fescue series, Nebraska sedge series, Rocky Mountain sedge series, Tufted hairgrass series.
>
> *Shrublands*: Big sagebrush series, Bitterbrush series, Bush chinquapin series, Greenleaf manzanita series, Huckleberry oak series, Mountain heather - bilberry series, Mountain whitethorn series, Parry rabbitbrush series, Tobacco bush series.

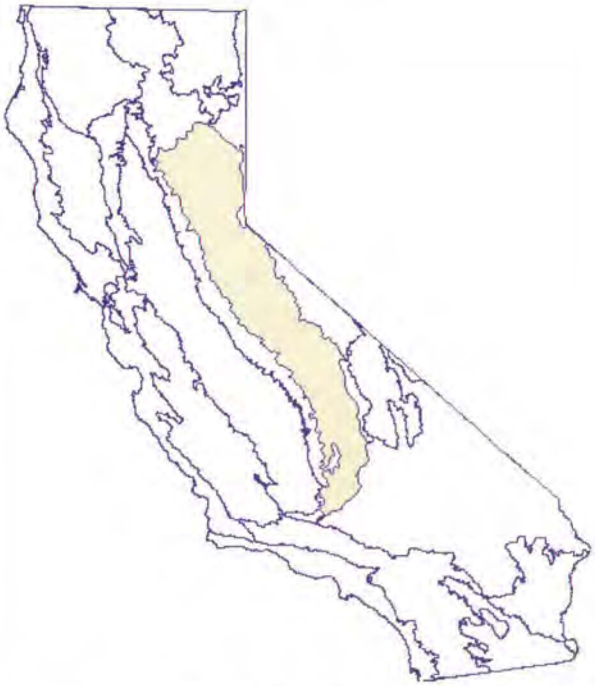
Subsection M261Dm, view south from
Mt. Lassen area — *Robert Ettner*

Forests and woodlands: Black oak series, Jeffrey pine series, Jeffrey pine - ponderosa pine series, Lodgepole pine series, Mixed subalpine forest series, Mountain hemlock series, Ponderosa pine series, Red fir series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 40 to 60 inches, but over 80 inches around Lassen Peak and just south of it. Most of the precipitation is snow. Mean annual temperature is about 30° to 45° F. The mean freeze-free period is from less than 25 to about 100 days.

Surface Water. Runoff is mostly rapid, but slow from floodplains and basins. Hydrothermal activity is common around Lassen Peak. There are many perennial ponds in the glacial till on the plateau east of Lassen Peak, and some ponds around Lassen Peak were created by landslides. The subsection, around Lassen Peak, is a hub of drainage divides, with streams flowing eastward to closed basins of the Modoc Plateau and the Great Basin, southward to the Feather River, westward to the Sacramento River, and northward to the Pit River. Lake Almanor is in a former lake basin at the head of the North Fork of the Feather River that has been dammed to raise the lake level.

CHAPTER 9



Section M261E
Sierra Nevada

This section is the temperate to very cold parts of the Sierra Nevada, which is a north-northwest aligned mountain range that is much steeper on the east than on the west side. It is in MLRA 22.

Geomorphology. Block mountain range tilted west; accordant crests. Sierra Nevada Range geomorphic province.

Lithology. Mesozoic granitic and ultramafic rocks, Paleozoic and Mesozoic strongly metamorphosed sedimentary and volcanic rocks, and Cenozoic volcanic rocks.

Soil Taxa. Alfisols, Andisols, Aridisols, Entisols, Inceptisols, Mollisols and Ultisols in combination with mesic, frigid or cryic soil temperature regimes and xeric, udic, aridic or aquic soil moisture regimes.

Vegetation. Predominant potential natural communities include the Mixed conifer series, Ponderosa pine series, Jeffrey pine series, White fir series, Red fir series, Lodgepole pine series, Huckleberry oak series, Western Juniper series, Aspen series, Big sagebrush series, Mixed subalpine forest series, Mountain hemlock series, Whitebark pine series and Giant sequoia series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Broom series, California annual grassland series, Cheatgrass series, Introduced perennial grassland series, Kentucky bluegrass series and Tamarisk series.
>
> *Series that can occur in all subsections, but are not extensive*: Bulrush series, Bulrush - cattail series, Bur-reed series, Common reed series, Cattail series, Creeping ryegrass series, Ditch-grass series, Duckweed series, Holodiscus series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Quillwort series, Saltgrass series, Sedge series, Spikerush series, Tufted hairgrass series and Yellow pond-lily series.
>
> *Series restricted to riparian settings*: Black cottonwood series, Mixed willow series, Montane wetland shrub habitat, Mountain alder series, Narrowleaf willow series, Pacific willow series, and Red willow series.

Fauna. Mammals include black-tail and mule deer, black bear, mountain lion, coyote, bobcat, red and gray fox, ringtail, weasels, skunks, badger, mountain sheep, yellow-bellied marmot, marten, fisher, wolverine and porcupine. Grizzly bear, native to the western slope became extinct in 1924. Birds include eagles, hawks, owls, woodpeckers, falcons, osprey, stellar jay, herons, quail, kingfisher, goshawk and blue grouse. Species of concern include the California spotted owl. Introduced species include turkey and beaver.

Elevation. 1,000 to 14,495 feet. Local relief ranges from 500 to 2000 feet.

Precipitation. 10 to 90 inches during fall, winter and spring. Occurs mostly as snow above 6000 feet. Rain

Section M261E, Middle Fork of the American River area — *Robert Ettner* on snow is common. Summers are commonly dry with low humidity.

Temperature. 25° to 60°F.

Growing Season. 10 to 200 days

Surface Water Characteristics. Many rapid flowing rivers and streams. Rivers flow west from the crest in deeply incised canyons with bedrock controlled channels to the Great Valley section and Pacific Ocean. Rivers flow east from the crest in mostly bedrock controlled channels terminating in basins in the Mojave Desert, Mono or Northwestern Basin and Range sections. There are numerous lakes and wet meadows associated with glaciated areas above 5,000 feet.

Disturbance Regimes.
Fire: At lower and mid-elevations, historic occurrence has changed from frequent, low intensity ground fires to infrequent, high intensity stand replacing fires. At higher elevations, historic occurrence has changed from infrequent, low and moderate intensity ground fires to infrequent, low, moderate and high intensity surface or stand replacing fires.
Seismic Activity: Seismically active areas along eastern boundary with strong shaking and ground rupture.
Climate: Wide fluctuations in precipitation and temperature for periods of years result in significant or catastrophic changes in biological communities. Snow avalanches are common at higher elevations.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to mining, grazing, forestry and recreational activities. Expanding urban uses occur scattered throughout foothills and some high elevation areas. Water diversions for hydroelectric power, agriculture, and municipal and domestic use are common within and between river systems.

Cultural Ecology. Humans have been utilizing the Sierra Nevada for about 10,000 years, and have been an integral part of its ecology for 3,000 to 5,000 years, particularly with documented use of fire to facilitate gathering and to generate species preferred for foodstuffs, basketry materials, and other needs. Extensive procurement and processing of lithic, acorn, pine nut, basketry fiber, and other resources resulted in innumerable areas of lithic quarry, bedrock mortar, pinyon, Jeffrey pine, sugar pine, oak grove, and other resource alteration. Contemporary attitudes and beliefs are dichotomized between emphasis on amenity/newcomer and commodity/long-time resident values. Human environment is characterized by a rural lifestyle of open space and outdoor leisure activity. Recreation is the primary economic emphasis, trailed by government employment, lumbering, mining, and grazing. The Sierra is experiencing rapid retiree and commuter resident growth, and large transient recreation populations that provide constant resource pressures.

Subsections. The Sierra Nevada Section is divided into 21 subsections.

Subsection M261Ea Diamond Mountain - Crystal Peak

This subsection is the steeper parts of the Diamond Mountains and a high plateau adjacent to the Diamond Mountains. The climate is temperate to cold and subhumid. MLRA 22e.

Lithology and Stratigraphy. Mesozoic granitic rocks, mostly hornblende - biotite granodiorite, predominate in this subsection. There are lesser amounts of Eocene nonmarine sedimentary rocks and post-Eocene andesite, basalt, rhyolite, and pyroclastic rocks. Some sedimentary deposits are intercalated with the late Tertiary volcanic rocks.

Geomorphology. This section includes a steep fault-line scarp, or Honey Lake fault escarpment, and a rolling plateau. The escarpment is the northeast margin of the Sierra Nevada. It is aligned toward the northwest, curving around toward the west-northwest at the northern end. The high plateau is a gently sloping to moderately steep fluvial erosion surface, some of which has been modified slightly by glaciation. It is capped by remnants of volcanic rock along the ridge above the Honey Lake fault escarpment, on Red Rock, Wildcat Ridge, and a few other high ridges. Indian Creek has cut a deep canyon across the plateau. The elevation ranges from about 4000 feet along Indian Creek and

Subsection M261Ea, eastern side of unit south of Susanville — *Robert Ettner*

4200 at the bottom of the Honey Lake fault escarpment, to 7738 feet on Diamond Mountain, 7795 feet on Thompson Peak, and 8197 feet on Adams Peak. Faulting, mass wasting, and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly shallow Typic and Dystric Xeropsamments; Typic and Entic Xerumbrepts; and, at lower elevations, Ultic Haploxeralfs. Those on volcanic rocks are mostly Lithic and Andic Xerumbrepts; Typic Argixerolls; and Andic Haploxeralfs. The soils are mostly well drained. Soil temperature regimes are mostly frigid, with some mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Jeffrey pine series and White fir series, and at lower elevations Mixed conifer series. Small areas of Red fir series are present higher elevations. Big sagebrush series and Low sagebrush series are common on very stony and shallow soils in volcanic terrain. The most common streamside riparian communities are Black cottonwood series at lower elevations and Mountain alder series at higher elevations. Lodgepole pine series and Aspen series are common, but not extensive. Sedge meadow communities occur in wet areas.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, Green fescue series, Idaho fescue series, Montane meadow habitat, Nebraska sedge series, Needle-and-thread series, Rocky Mountain sedge series.

Shrublands: Big sagebrush series, Bitterbush series, Greenleaf manzanita series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series, Tobacco brush series.

Forests and woodlands: Aspen series, Baker cypress stands, Jeffrey pine series, Jeffrey pine - ponderosa pine series, Lodgepole pine series, Ponderosa pine series, Red fir series, Western white pine series, White fir series.

Climate. The mean annual precipitation is about 20 to 30 inches; much of it falls as snow. Mean annual temperature is about 35° to 50° F. The mean freeze-free period is about 25 to 100 days.

Surface Water. Runoff is rapid from most of the area. There are a few small lakes, or ponds, in glaciated terrain. Streams on the Honey Lake escarpment drain to Honey Lake. Those on the plateau west of the escarpment drain through Indian Creek to the Feather River.

Subsection M261Eb
Fredonyer Butte - Grizzly Peak

This subsection extends from the northern edge of the Sierra Nevada, which is along the Susan River, south to Grizzly Peak. It has a temperate to cold, subhumid to humid climate. MLRA 22e.

Lithology and Stratigraphy. Strongly folded basement rocks predominate in this subsection. They include metamorphosed Jurassic marine sedimentary, Jurassic-Triassic volcanic, and Paleozoic marine sedimentary and volcanic rocks. There are a few small Mesozoic granitic bodies. Tertiary volcanic rocks, largely dacitic lahar, and nonmarine sedimentary rocks are moderately extensive in the northern part of the subsection. Quaternary alluvium has accumulated in Mountain Meadows and a few smaller valleys.

Geomorphology. Steep mountain and moderately steep hill slopes predominate in this subsection. Alluvial fans, floodplains, terraces, and basin floors are present but not extensive. Keddie Ridge, one of the few mountains that is distinctly elongated, is aligned toward the west-northwest. The elevation ranges from about 4000 feet along Lights Creek up to 7387 feet on Hamilton Mountain, 7472 on Dyer Mountain on Keddie Ridge, and 8197 feet on Grizzly Peak. Faulting, mass wasting, and fluvial erosion are the main geomorphic processes. The north sides of Grizzly Peak and Keddie Ridge were glaciated during the Pleistocene.

Soils. The soils are mostly Ultic Argixerolls, Ultic Haploxeralfs, Ultic Palexeralfs, Andic Xerumbrepts; Pachic Haploxerolls; and a diverse group of shallow soils. There are Aquolls in Mountain Meadows. The soils are mostly well drained, some soils in meadows are poorly drained. Soil temperature regimes are mesic and frigid. Soil moisture regimes are mostly xeric, but aquic in Mountain Meadows.

Vegetation. The predominant natural plant communities are Jeffrey pine series, Mixed conifer series, and White fir series. Small areas of Red fir series occur at the highest elevations. Western juniper series is present on some shallow soils. The most common streamside riparian communities are Black cottonwood at lower elevations and Mountain alder series at higher elevations. Sedge meadow communities occur in wet areas.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, Green fescue series, Idaho fescue series, Montane meadow habitat, Nebraska sedge series, Needle-and-thread series, Rocky Mountain sedge series.

Shrublands: Bitterbush series, Greenleaf manzanita series, Parry rabbitbrush series, Rubber rabbitbrush series, Tobacco brush series.

Forests and Woodlands: Aspen series, Incense-cedar series, Jeffrey pine series, Jeffrey pine - Ponderosa pine series, Mixed conifer series, Mountain juniper series, Ponderosa pine series, Red fir series, Western white pine series, White fir series.

Climate. The mean annual precipitation is about 20 to 40 inches; much of it falls as snow. Mean annual temperature is about 40° to 50° F. The mean freeze-free period is about 50 to 125 days.

Surface Water. Runoff is rapid from most of the area, but slow on the basin floor in Mountain Meadows. Most of the runoff flows to tributaries of the Feather River. In the northern part of the subsection it flows to the Susan River, which runs to Honey Lake. There is a reservoir on Mountain Meadows.

Subsection M261Ec Frenchman

This subsection is in mostly Tertiary volcanic terrain north of Sierra Valley. It has a temperate to cold, semi-arid to subhumid climate. MLRAs 21e and 22e.

Lithology and Stratigraphy. Miocene andesite and pyroclastic rocks predominate in this subsection. There are lesser amounts of Pliocene basalt and pyroclastic rocks, some exposures of Mesozoic granitic rocks, and, on the western edge of the subsection, early Tertiary and Paleozoic sedimentary rocks. Quaternary alluvial and lacustrine deposits have accumulated in valleys.

Geomorphology. Steep mountain and moderately steep hill slopes predominate in this subsection. Alluvial fans, floodplains, terraces, and basin floors are present but much less extensive. Most of the faults, and mountains that are elongated, are aligned toward the northwest. The elevation ranges from about 5000 feet adjacent to Sierra Valley up to 8323 feet on Dixie Mountain and 8372 feet on Mt. Ingalls. Faulting, mass wasting, and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Ultic Argixerolls, Ultic Haploxeralfs, Andic Xerumbrepts, and a diverse group of shallow soils, plus Dystric Xeropsamments, Entic Haploxerolls, and Entic and Dystric Xerochrepts on granitic rocks. There are Cumulic Endoaquolls, Aridic Haploxerolls, and Aridic and Pachic Argixerolls on alluvial and lacustrine deposits. The soils are mostly well drained and some are poorly drained. Soil temperature regimes are mostly frigid, with some mesic in valleys. Soil moisture regimes are mostly xeric, but some are aridic and some in valleys are aquic.

Vegetation. The predominant natural plant communities are Jeffrey pine series, Mixed conifer series, and White fir series. There are small areas of Red fir series at the highest elevations, plus Mountain hemlock series on Mt. Ingalls. Western juniper series occurs on some shallow soils. Big sagebrush is common in valleys. The most common streamside riparian communities are Black cottonwood at lower elevations and Mountain alder series at higher elevations. Aspen series occurs in some moist habitats. Sedge meadow communities occur in wet areas.

Characteristic series by lifeform include:
Grasslands: Alpine habitat, Ashy ryegrass series, Breaked sedge series, Green fescue series, Idaho fescue series, Montane meadow habitat, Nebraska sedge series, Needle-and-thread series, Rocky Mountain sedge series.
Shrublands: Big sagebrush series, Bitterbush series, Bush chinquapin series, Deerbrush series, Greenleaf manzanita series, Huckleberry oak series, , Mountain whitethorn series, Tobacco brush series, Wedgeleaf ceanothus series.
Forests and woodlands: Aspen series, Incense-cedar series, Jeffrey pine series, Jeffrey pine - Ponderosa pine series, Mixed conifer series, Mountain hemlock series, Mountain juniper series, Ponderosa pine series, Red fir series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 15 to 30 inches; much of it falls as snow. Mean annual temperature is about 40° to 50° F. The mean freeze-free period is about 50 to 100 days.

Surface Water. Runoff is rapid from most of the area, but slow on the basin floors. The runoff flows to tributaries of the Feather River. There are large reservoirs, Lake Davis and Frenchman Lake, in two valleys.

Subsection M261Ec, Stoney Ridge area — *Robert Ettner*

Subsection M261Ed Greenville - Graeagle

This subsection extends from the northwestern edge of the Sierra Nevada, adjacent to Lake Almanor, along the Plumas Trough to Mohawk Valley. It has a temperate to cold, subhumid to humid climate. MLRAs 22d and 22e.

Lithology and Stratigraphy. Strongly folded basement rocks predominate in this subsection. They include Triassic marine sedimentary and Paleozoic marine sedimentary and metavolcanic rocks. There is a large intrusion of Mesozoic ultramafic rock in the Red Hill area. Quaternary alluvial and lacustrine deposits are moderately extensive in Indian, Genessee, Meadow, American, and Mohawk Valleys.

Geomorphology. Steep mountain and moderately steep hill slopes in the Plumas trough and on both sides of it predominate in this subsection. Alluvial fans, floodplains, terraces, and basin floors are moderately extensive. The Plumas trough is an active northwest trending tectonic zone that separates the main part of the Sierra Nevada on the southwest from the block faulted part of the Sierra Nevada on the northeast. The elevation ranges from about 2500 feet along the Feather River up to 6341 feet on Red Hill and 6362 feet on Rush Creek Hill. Faulting, mass wasting, and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Ultic Haploxeralfs, Dystric Lithic Xerochrepts, Ultic Palexeralfs, and Typic Haploxerults. They are mostly Lithic Haploxerolls, Typic Xerochrepts, and Ultic Haploxeralfs on ultramafic rocks. There are Cumulic Endoaquolls and Typic and Cumulic Haplaquolls on basin floors. The soils are mostly well drained, but mostly poorly drained on basin floors. Soil temperature regimes are mostly mesic. Soil moisture regimes are mostly xeric, but aquic on basin floors.

Vegetation. The predominant natural plant community is Mixed conifer series with Ponderosa pine series on south-facing slopes and Jeffrey pine series on ultramafic rocks. Jeffrey pine series is also common in the drier southeast part of the subsection. There is some White fir series at higher elevations. Canyon live oak series occurs on steep rocky slopes. The most common streamside riparian communities are Black cottonwood series in the northwestern part and White alder series in the southeastern part of the subsection. Sedge meadow communities occur in wet areas.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, California oatgrass series, Darlingtonia series, Idaho fescue series, Montane meadow habitat, Needle-and-thread series.
Shrublands: Birchleaf mountain-mahogany series, Bush chinquapin series, Deerbrush series, Greenleaf manzanita series, Huckleberry oak series, Interior live oak series, Mountain whitethorn series, Tobacco brush series, Wedgeleaf ceanothus series.
Forests and woodlands: Birchleaf mountain-mahogany series, Black oak series, Canyon live oak series, Douglas-fir series, Douglas-fir - Ponderosa pine series, Douglas-fir - tanoak series, Incense-cedar series, Jeffrey pine series, Jeffrey pine - Ponderosa pine series, Mixed conifer series, Ponderosa pine series, Red fir series, White fir series.

Climate. The mean annual precipitation is about 30 to 60 inches; much of it falls as snow. Mean annual temperature is about 45° to 55° F. The mean freeze-free period is about 75 to 150 days.

Surface Water. Runoff is rapid from most of the area, but slow on basin floors. Most of the runoff flows to the Feather River or its tributaries. The Feather River flows across the Sierra Nevada to the Sacramento Valley.

Subsection M261Ee Bucks Lake

This subsection is the higher part of a granitic pluton and surrounding rocks in the vicinity of Bucks Lake. It has a temperate to cold, humid climate. MLRAs 22c and 22d.

Lithology and Stratigraphy. Mesozoic granitic rocks predominate in this subsection. Also, there are Paleozoic marine sedimentary and metavolcanic rocks. Quaternary alluvium and glacial till are present, but not extensive.

Geomorphology. This subsection is on a gently sloping to moderately steep plateau that is bisected by the North Fork of the Feather River. The North Fork has cut across the plateau and runs in the bottom of a very steep sided canyon, about 2000 to 4000 feet below the plateau surface. Higher parts of the plateau and the northern edge of it were glaciated during the Pleistocene. The elevation ranges from about 2000 feet along Feather River up to 7176 feet on Bald Eagle Hill. Fluvial erosion and, in the Feather River canyon, mass wasting are the main geomorphic processes.

Soils. The soils on granitic rocks are mostly Dystric, Lithic, and shallow Typic Xeropsamments and Typic and Dystric Xerochrepts. On other kinds of rocks they are mostly Dystric Xerochrepts; Andic Xerumbrepts; Lithic Ultic and Ultic Haploxerolls; and Ultic Haploxeralfs. The soils are well drained. Soil temperature regimes are frigid on the plateau and mostly mesic in the canyon of the Feather River. Soil moisture regimes are mostly xeric.

Vegetation. The predominant natural plant communities are Mixed conifer series and White fir series. Jeffrey pine series is common in glacially eroded, or scoured, terrain. There is some Red fir series at higher elevations. Huckleberry oak series occurs on very stony colluvium, or talus. Wet areas with Sedge meadow communities and Mountain alder series or Lodgepole pine series are common, but not extensive.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, Green fescue series, Idaho fescue series, Montane meadow habitat, Nebraska sedge series, Needle-and-thread series, Rocky Mountain sedge series.
Shrublands: Bush chinquapin series, Deerbrush series, Greenleaf manzanita series, Huckleberry oak series, , Mountain whitethorn series, Tobacco brush series, Wedgeleaf ceanothus series.
Forests and woodlands: Douglas-fir series, Douglas-fir - Ponderosa pine series, Douglas-fir - tanoak series, Incense-cedar series, Jeffrey pine series, Lodgepine pine series, Mixed conifer series, Red fir series, Western white pine series, White fir series.

Climate. The mean annual precipitation is about 60 to 90 inches. Much of the precipitation is snow; it is mostly snow on the high plateau. Mean annual temperature is about 40° to 55° F. The mean freeze-free period is about 50 to 150 days.

Surface Water. Runoff is rapid from most of the area. Most of the runoff flows to the North Fork of the Feather River or its tributaries. There are some small lakes, or ponds, in the glaciated terrain, and a large reservoir (Bucks Lake).

Subsection M261Ef Granitic and Metamorphic Hills

This subsection is the low to intermediate elevations of the western slope of the Sierra Nevada where it is crossed by the Feather and Yuba Rivers. It has a temperate and humid climate. MLRA 22c.

Lithology and Stratigraphy. Mesozoic granitic rocks and Jurassic - Triassic metavolcanic rocks are most extensive in this subsection. Paleozoic marine sedimentary, ultramafic, and mafic plutonic rocks are moderately extensive. There are small areas of basalt and andesite in the northern part of the subsection, and andesitic lahar along the southeastern edge of the subsection. Quaternary alluvium and glacial till are present, but not extensive.

Geomorphology. This subsection is on a gently sloping to moderately steep plateau that is crossed by the North, Middle, and South Forks of the Feather River and the North Yuba, Middle Yuba, and South Yuba Rivers. These rivers run in the bottom of very steep sided canyons that are as much as 2000 feet below the plateau surface. The elevation ranges from about 1000 feet up to 6095 feet on Table Mountain, but most of the rolling plateau is below 5000 feet in this subsection. Fluvial erosion and, in the river canyons, mass wasting are the main geomorphic processes.

Subsection M261Ef, Middle Fork of Feather River area — *James R. Nelson*

Soils. The soils are mostly Typic, Dystric, and shallow Dystric Xerochrepts; Mollic and Ultic Haploxeralfs; Lithic Xeropsamments; and shallow Entic Haploxerolls on granitic rocks; plus Typic Haploxerults; Xeric Haplohumults; Lithic and Dystric Lithic Xerochrepts; and Ultic Palexeralfs on other kinds of rocks. The soils are well drained. Soil temperature regimes are mostly mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant community is Mixed conifer series. Douglas-fir - tanoak series is common in areas of greater precipitation. There is some Ponderosa pine series at lower elevations, Canyon live oak series on very steep, rocky canyon sideslopes, and Mixed chaparral shrublands on steep south-facing slopes with shallow soils.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, California oatgrass series, Idaho fescue series, Montane meadow habitat, Needle-and-thread series.

Shrublands: Brewer oak series, Chamise series, Deerbrush series, Greenleaf manzanita series, Interior live oak series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Birchleaf mountain-mahogany series, Black oak series, Canyon live oak series, Douglas-fir series, Douglas-fir - Ponderosa pine series, Douglas-fir - tanoak series, Incense-cedar series, Mixed conifer series, Ponderosa pine series, Tanoak series.

Climate. The mean annual precipitation is about 40 to 80 inches; much of it falls as snow. Mean annual temperature is about 45° to 60° F. The mean freeze-free period is about 100 to 200 days.

Surface Water. Runoff is rapid from most of the area. Most of the runoff flows to the Feather River or Yuba River or tributaries of them. There are no natural lakes, but some reservoirs.

Subsection M261Eg
Upper Foothills Metamorphic Belt

This subsection is the intermediate elevations of the western slope of the Sierra Nevada where it is crossed by the Yuba, American, Cosumnes, Mokelumne, Stanislaus, and Tuolumne Rivers. It has a temperate and humid climate. MLRAs 22c and 22d.

Subsection M261Eg, North Fork of Middle Fork of American River area — *Robert Ettner*

Lithology and Stratigraphy. Metamorphosed Paleozoic marine sedimentary rocks predominate in this subsection; they are in the Shoo Fly and Calaveras Complexes. Also, Mesozoic granitic and late Tertiary volcanic rocks are moderately extensive, and there are some Jurassic - Triassic metavolcanic and Jurassic marine sedimentary rocks. The volcanic rocks are mostly Miocene and Pliocene lahars. There is a strip of ultramafic rocks along the west side of the Melones Fault Zone and a few patches of them east of the fault zone.

Geomorphology. This subsection is on a gently sloping to moderately steep plateau that is crossed by the Yuba, American, Cosumnes, Mukelumne, Stanislaus, and Tuolumne Rivers. These rivers and the north, south, and middle forks of them run in the bottoms of very steep sided canyons that are as much as 2000 feet below the plateau surface. The elevation ranges about 2000 to 7000 feet, but is mostly below 6000 feet. Fluvial erosion and, in the river canyons, mass wasting are the main geomorphic processes.

Soils. The soils are mostly Typic Haploxerults and Dystric and Dystric Lithic Xerochrepts on sedimentary and metamorphic rocks. The Dystric Lithic Xerochrepts are mostly on steep canyon sideslopes. Soils on granitic rocks are mostly Ultic Haploxeralfs; Dystric and shallow Dystric Xerochrepts; and Entic Xerumbrepts. Soils on volcanic rocks are mostly Andic and Lithic Xerumbrepts; Ultic Haploxeralfs; and Xeric Haplohumults. Mollic Haploxeralfs predominate on ultramafic rocks. The soils are well drained. Soil temperature regimes are mostly mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Mixed conifer series and, at lower elevations, Ponderosa pine series. There is some White fir series at higher elevations, Canyon live oak series on very steep, rocky canyon sideslopes, and Mixed chaparral shrublands on steep south-facing slopes with shallow soils. The northernmost grove of trees in the Giant sequoia series is in this subsection.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, California oatgrass series, Idaho fescue series, Montane meadow habitat, Needle-and-thread series.

Shrublands: Brewer oak series, Chamise series, Deerbrush series, Greenleaf manzanita series, Interior live oak series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Birchleaf mountain-mahogany series, Black oak series, Canyon live oak series, Douglas-fir series, Douglas-fir - Ponderosa pine series, Douglas-fir - tanoak series, Incense-cedar series, Knobcone pine series, Mixed conifer series, Ponderosa pine series, Sequoia series, Tanoak series, White fir series.

Climate. The mean annual precipitation is about 40 to 80 inches. Much of the precipitation is snow; it is mostly snow above about 4000 feet. Mean annual temperature is about 45° to 55° F. The mean freeze-free period is about 100 to 150 days.

Surface Water. Runoff is rapid from most of the area. Most of the runoff flows to the Yuba, American, Cosumnes, Mukelumne, Stanislaus, or Tuolumne Rivers or tributaries of them. Maximum flow in these rivers is much later than that in tributaries that head within the subsection, because of snow melt at higher elevation east of this subsection. There are no natural lakes, but some reservoirs.

Subsection M261Eh Upper Batholith and Volcanic Flows

This subsection is the moderately high elevations of the western slope of the Sierra Nevada. It is just west of a fault zone from Mohawk Valley, which is in the Plumas Trough, to Lake Tahoe; and it is west of the crest of the Sierra Nevada south of Lake Tahoe as far as the Middle Fork of the Stanislaus River. It has a cold and humid climate. MLRAs 22d and 22e.

Lithology and Stratigraphy. Mesozoic granitic and post-batholith volcanic rocks predominate in this subsection, but pre-batholith rocks are common, too. The volcanic rocks are mostly Miocene and Pliocene andesitic lahars of the Mehrten Formation. The pre-batholith rocks are mostly metamorphosed Paleozoic and Jurassic marine sedimentary and volcanic rocks. Pleistocene glacial till and outwash are common and there are small areas of Quaternary alluvial and lacustrine deposits.

Subsection M261Eh, Grouse Ridge area northwest of Cisco Grove — *Howdy Goudey*

Geomorphology. This subsection is on a gently sloping to moderately steep plateau with steep canyon slopes. Glacial erosion has modified the valleys in at least the higher parts of the subsection. Several large rivers between the Feather and Stanislaus Rivers head in or cross the subsection. Some of these rivers flow in the bottoms of very steep sided canyons. Many canyons U-shaped from glacial erosion. The elevation ranges from about 4000 or 5000 to 8000 feet, and up to 8587 feet on Sierra Buttes and 9006 feet on Granite Chief. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Entic, Lithic, Typic, Andic, and Pachic Xerumbrepts; Dystric Xeropsamments; and Dystric Xerochrepts. There are some Cryumbrepts at the highest elevations. The soils are mostly well drained. Soil temperature regimes are mostly frigid, but some are cryic. Soil moisture regimes are mostly xeric. Soils have udic moisture regimes where snow persists through spring, and melts to keep soils moist well into the summer. Soils with aquic moisture regimes are present in glaciated terrain and small valleys.

Vegetation. The predominant natural plant communities are, from lower to higher elevations, Mixed conifer series, White fir series, and Red fir series. Jeffrey pine series occurs on shallow and rocky soils. There are a few small patches of Mountain hemlock series at higher elevations. Lodgepole pine series prevails on many wet soils and on drier soils where cold air drainage and frost limit the regeneration of other conifers. Aspen series and Mountain alder series are common in riparian or wet areas. Sedge meadow communities are common, but they are not extensive.

Characteristic series by lifeform include:

Grasslands: Alpine habitat, Breaked sedge series, Fen habitat, Green fescue series, Montane meadow habitat, Nebraska sedge series, Rocky Mountain sedge series, Shorthair reedgrass series, Shorthair sedge series.

Shrublands: Bush chinquapin series, Greenleaf manzanita series, Huckleberry oak series, Mountain whitethorn series, Tobacco brush series.

Forests and woodlands: Aspen series, Jeffrey pine series, Mixed conifer series, Mountain hemlock series, Red fir series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 40 to 80 inches; most of it falls as snow. Mean annual temperature is about 35° to 50° F. The mean freeze-free period is about 25 to 100 days.

Surface Water. Runoff is rapid from most of the area. Most of the runoff flows to the Feather, Yuba, American, Cosumnes, Mukelumne, or Stanislaus Rivers or their tributaries. Some flows from the eastern margin of the subsection to the Truckee River. Maximum flow in these rivers is during spring when snow melt is rapid. There are many small natural lakes or ponds in glaciated terrain, and some reservoirs.

Subsection M261Ei
Sierra Valley

This subsection comprises Sierra Valley, which is in the block-faulted part of the Sierra Nevada, at the head of the Middle Fork of the Feather River. It has a temperate, semi-arid to subhumid climate. MLRA 21e.

Lithology and Stratigraphy. Quaternary lacustrine deposits dominate this subsection. There are small areas of Quaternary alluvial deposits around the margins of Sierra Valley and in tributary valleys.

Geomorphology. Most of the subsection is on nearly level basin floor that was occupied by a shallow Pleistocene lake. There are sloping to nearly level alluvial fans and floodplains around the margins of the basin and in tributary valleys. The elevation ranges from about 4900 feet on the basin floor up to about 5400 feet on alluvial fans. Faulting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Pachic and Aquic Argixerolls, Aridic Haploxerolls, Typic Haplaquolls, and Aquic Natrargids, plus Abruptic Xerollic Durargids on alluvial fans on the east side of the valley. The soils are well to poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric on the west side, commonly aquic on the basin floor, and aridic on the east side of the valley.

Subsection M261Ei, Sierra Valley
north of Sierraville — *Robert Ettner*

Vegetation. The predominant natural plant communities are Big sagebrush series and Sedge meadow communities. Jeffrey pine series occurs on the south and west margins of Sierra Valley.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, Breaked sedge series, Idaho fescue series, Montane meadow habitat, Needle-and-thread series, Rocky Mountain sedge series.

Shrublands: Big sagebrush series, Bitterbrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series.

Forests and woodlands: Aspen series, Jeffrey pine series.

Climate. The mean annual precipitation is about 10 to 25 inches; most of it falls as snow. Mean annual temperature is about 45° to 48° F. The mean freeze-free period is about 50 to 100 days.

Surface Water. Runoff is slow from most of the area. The runoff flows through the Middle Fork of the Feather River.

Subsection M261Ej
Tahoe - Truckee

This subsection is near the southern end of the block-faulted northeastern part of the Sierra Nevada. It is between Sierra Valley and Lake Tahoe. It has a cold and semi-arid to humid climate. MLRA 22e.

Lithology and Stratigraphy. Cenozoic volcanic rocks predominate in this subsection. There are some Mesozoic granitic rocks, Jurassic marine sedimentary rocks, and Jurassic and older metavolcanic rocks. The Cenozoic volcanic rocks are mostly Pliocene andesite, basalt and pyroclastic rocks and Pleistocene basalt. Pleistocene glacial till and outwash are common and there are small areas of Quaternary alluvial and lacustrine deposits.

Geomorphology. This subsection is on a gently sloping to moderately steep plateau with some steep mountains that is dissected by streams in canyons that have steep to very steep sideslopes. Most of the canyons on the west side of the subsection have been modified by glacial erosion and are U-shaped there. The elevation ranges from about 5000 along the Truckee River and adjacent to Sierra Valley up to 9143 feet on Mt. Lola. Faulting, mass wasting, and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Ultic and Mollic Haploxeralfs; Lithic Ultic Haploxerolls; Ultic and Lithic Ultic Argixerolls; Andic Xerochrepts; and Andic Xerumbrepts. There are some Cryumbrepts at the highest elevations. Soils on granitic rocks are mostly Entic Haploxerolls and shallow Typic Xeropsamments, but they are not extensive. Soils on glacial till are mostly Pachic, Entic, and Typic Xerumbrepts. The soils are mostly well drained, but some on basin floors are somewhat poorly drained. Soil temperature regimes are mostly frigid, but some are cryic. Soil moisture regimes are mostly xeric. Soils with aquic moisture regimes are present in glaciated terrain and small valleys, but they are not extensive.

Vegetation. The predominant natural plant communities are Ponderosa pine series, Mixed conifer series, White fir series, Red fir series, and Big sagebrush series. Jeffrey pine series is common in drier areas on shallow and rocky soils. There are a few small patches of Mountain hemlock series at the highest elevations. Lodgepole pine series prevails on many wet soils and on drier soils where cold air drainage and frost limit the regeneration of other trees. Sedge meadow communities are common, but they are not extensive. Black cottonwood series is common in riparian areas and there is some Aspen series.

Characteristic series by lifeform include:

Grasslands: Alpine habitat, Ashy ryegrass series, Breaked sedge series, Fen habitat, Idaho fescue series, Montane meadow habitat, Needle-and-thread series, Rocky Mountain sedge series, Shorthair reedgrass series, Shorthair sedge series.

Shrublands: Big sagebrush series, Bitterbrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series.

Forests and woodlands: Aspen series, Jeffrey pine series, Lodgepole pine series, Mixed conifer series, Mountain hemlock series, Ponderosa pine series, Red fir series, Washoe pine series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 20 to 40 inches; most of it falls as snow. Mean annual temperature is about 35° to 45° F. The mean freeze-free period is about 25 to 75 days.

Surface Water. Runoff is rapid from most of the area. Most of it flows to the Truckee River, but runoff from the northern part of the subsection flows to Sierra Valley, which is at the head of the Middle Fork of the Feather River. Maximum flow in these rivers is during spring when snow is melting rapidly. There are many small and a few large natural lakes or ponds in glaciated terrain, and some reservoirs.

Subsection M261Ek Glaciated Batholith and Volcanic Flows

This subsection is along the crest of the Sierra Nevada from the Crystal Range southwest of Lake Tahoe to Kennedy Peak just south of Sonora Pass. It has a cold to very cold and humid climate. MLRA 22e.

Lithology and Stratigraphy. Mesozoic granitic and post-batholith volcanic rocks predominate in this subsection; pre-batholith rocks are sparse. Mesozoic mafic plutonic rocks are common. The volcanic rocks are mostly Pliocene andesite and lahars of the Mehrten Formation. The pre-batholith rocks are mostly metamorphosed Jurassic marine sedimentary and early Mesozoic volcanic rocks. Pleistocene glacial till and outwash are common and there are small areas of Quaternary alluvial and lacustrine deposits.

Geomorphology. This subsection is characterized by steep mountains that rise above the plateau west of the crest and have deep V- to U-shaped canyons. Glacial erosion has modified most of the landforms. Cirques, aretes, cols, horns, and smooth, striated bedrock are common. The moraines have been modified by fluvial erosion. Some of the rivers flow in the bottoms of very steep sided canyons. The elevation ranges from about 7000 up to 11,570 feet on Leavitt Peak. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric Xeropsamments; Entic, Typic, and Pachic Xerumbrepts; and Cryumbrepts. Much of the granitic rock is barren, lacking soil. There are Andic and Lithic Cryumbrepts on volcanic rocks. The soils are mostly well drained. Soil temperature regimes are mostly frigid and cryic. Soil moisture regimes are mostly xeric. Soils have udic moisture regimes where snow persists through spring,

Subsection M261Ek, Silver Lake area — *James R. Nelson* melting to keep soils moist through much of the summer. Soils with aquic moisture regimes are present in glaciated terrain and small valleys, but they are not extensive.

Vegetation. Most of this subsection is sparsely vegetated. The main natural plant communities are Mixed subalpine forest series and Red fir series and communities of Subalpine meadow habitats. Jeffrey pine series is common on shallow and rocky soils. There are a few small patches of Mountain hemlock series at high elevations, and Aspen series occurs at lower elevations. Lodgepole pine series prevails on many wet soils and on drier soils where cold air drainage and frost limit the regeneration of other conifers. Aspen series is common where drifted snow accumulates and provides water during summer. Sedge meadow communities are common, but they are not extensive.

Characteristic series by lifeform include:

Grasslands: Alpine habitat, Breaked sedge series, Fen habitat, Green fescue series, Montane meadow habitat, Mountain heather - bilberry series, Nebraska sedge series, Rocky Mountain sedge series, Rothrock sagebrush series, Shorthair reedgrass series, Shorthair sedge series, Subalpine meadow habitat.

Shrublands: Bush chinquapin series, Greenleaf manzanita series, Huckleberry oak series, Mountain whitethorn series, Subalpine upland shrub habitat, Subalpine wetland shrub habitat, Tobacco brush series.

Forests and woodlands: Aspen series, Lodgepole pine series, Mixed subalpine forest series, Mountain hemlock series, Red fir series, Western white pine series, Whitebark pine series.

Climate. The mean annual precipitation is about 40 to 60 inches; most of it falls as snow. Mean annual temperature is about 30° to 40° F. The mean freeze-free period ranges from less than 25 to about 50 days.

Surface Water. Runoff is rapid from most of the area. Most of the runoff flows to the American, Cosumnes, Mukelumne, or Stanislaus Rivers on the west or to Lake Tahoe or the Carson or Walker Rivers on the east. Maximum flow in these rivers is during spring when snow is melting rapidly. There are many small natural lakes or ponds in glaciated terrain, and some reservoirs.

Subsection M261El Tahoe Valley

This subsection is a valley at the southern end of Lake Tahoe. It has a cold subhumid climate. MLRA 22e.

Lithology and Stratigraphy. Quaternary glacial till, outwash, lacustrine deposits, and alluvium dominate this subsection. A small hill of Mesozoic granitic and Jurassic marine sedimentary rocks sticks up through the Quaternary deposits.

Subsection M261El, Upper Truckee River area from Echo Summit — *Robert Ettner*

Geomorphology. The main landforms are gently sloping to moderately steep glacial moraines and nearly level to very gently sloping outwash plain, lake plain, floodplain, and alluvial fans. The elevation ranges from 6230 feet along the shore of Lake Tahoe up to about 7500 feet. Fluvial and lacustrine erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Entic and Pachic Xerumbrepts on till and Alfic Xeropsamments, Entic Xerumbrepts, and Aquic Cryumbrepts on alluvial deposits. The soils are mostly well to somewhat poorly drained with some poorly drained soils. Soil temperature regimes are mostly frigid, but cryic in somewhat poorly drained soils. Soil moisture regimes are mostly xeric, with some aquic.

Vegetation. The predominant natural plant communities on well drained soils are Jeffrey pine series and White fir series, with the latter increasing in dominance toward the west. Sedge meadow communities and Willow thickets predominate in wet areas, with Lodgepole pine series around the margins of wet areas. Aspen series occurs in moist habitats.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, Breaked sedge series, Idaho fescue series, Montane meadow habitat, Needle-and-thread series, Rocky Mountain sedge series.

Shrublands: Big sagebrush series, Bitterbrush series, Low sagebrush series, Rubber rabbitbrush series.

Forests and woodlands: Aspen series, Jeffrey pine series, Lodgepole pine series, White fir series.

Climate. The mean annual precipitation is about 20 to 30 inches; most of it falls as snow. Mean annual temperature is about 40° to 45° F. The mean freeze-free period is in the range from 50 to 75 days.

Surface Water. Runoff is slow from most of the area. The runoff flows to Lake Tahoe, which is drained by the Truckee River.

Subsection M261Em Batholith and Volcanic Flows

This subsection comprises the mid-elevations of the western slope of the Sierra Nevada between the American River and Merced River. It has a temperate and humid climate. MLRA 22d.

Lithology and Stratigraphy. Mesozoic granitic, mainly adamellite and granodiorite, and post-batholith volcanic rocks predominate in this subsection, but there are some pre-batholith rocks, too. The volcanic rocks are mostly Miocene and Pliocene andesitic lahars of the Mehrten Formation that include interbedded gravels and sands south of the Mokelumne River. The pre-batholith rocks are mostly metamorphosed Paleozoic marine sedimentary rocks.

Geomorphology. This subsection is on a gently sloping to moderately steep plateau with some steep hills on it. Several large rivers from the American to the Merced Rivers cross the subsection. These rivers and some of their tributaries flow in the bottoms of very steep sided canyons that are up to 2000 feet deep. The elevation ranges from about 3000 to 6000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric and shallow Dystric Xerochrepts; Ultic Haploxeralfs; and Entic and Pachic Xerumbrepts on granitic rocks. They are mostly Andic and Entic Xerumbrepts; Ultic Haploxeralfs; and Xeric Haplohumults on volcanic rocks. The soils are mostly well drained. Soil temperature regimes are mostly mesic. Soil moisture regimes are xeric.

Subsection M261Em, view eastward from Cherry Lake area — *David Schultz*

Vegetation. The predominant natural plant communities, from lower to higher elevations, are Ponderosa pine series, Mixed conifer series, and White fir series. There is Jeffrey pine series in volcanic terrain at higher elevations. Canyon live oak series is common on very steep rocky slopes.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, California oatgrass series, Montane meadow habitat, Needle-and-thread series.

Shrublands: Brewer oak series, Deerbrush series, Greenleaf manzanita series, Interior live oak series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Canyon live oak series, Douglas-fir series, Douglas-fir - Ponderosa pine series, Incense-cedar series, Jeffrey pine series, Knobcone pine series, Mixed conifer series, Ponderosa pine series, White fir series.

Climate. The mean annual precipitation is about 40 to 60 inches; much of it falls as snow. Mean annual temperature is about 45° to 55° F. The mean freeze-free period is in the range from 100 to 150 days.

Surface Water. Runoff is rapid; it flows to the American, Cosumnes, Mokelumne, Stanislaus, Tuolumne, or Merced Rivers or tributaries of them. Maximum flow in these rivers is during spring when snow is melting rapidly. There are no natural lakes, but there are some reservoirs in the subsection.

Subsection M261En Markleeville

This subsection comprises the mountainous terrain just east of the crest of the Sierra Nevada, from the south end of the Carson Range southeastward to the West Walker River near Antelope Peak. It has a cold and subhumid climate. MLRA 22e.

Lithology and Stratigraphy. Mesozoic granitic and post-batholith volcanic rocks predominate in this subsection; pre-batholith rocks are sparse. The volcanic rocks are mostly Pliocene andesite and lahars. The pre-batholith rocks are mostly undifferentiated metamorphic rocks. There are small areas of Pleistocene glacial till and outwash and Quaternary alluvium.

Geomorphology. This subsection is characterized by steep to very steep mountains. Glacial erosion has modified much of the subsection. Cirques, aretes, cols, and horns are common. The rivers flow through both very steep sided V-shaped canyons and U-shaped canyons. Alluvial basin floors are more extensive in the U-shaped canyons. The elevation ranges from about 6000 to 9000 feet, but up to 10023 on Hawkins Peak and 10241 feet on Antelope Peak. Mass wasting and fluvial erosion are the main geomorphic processes. Pleistocene glaciation greatly modified the landscape.

Soils. The soils are mostly Andic Xerumbrepts, Ultic Haploxeralfs, Lithic Ultic Argixerolls, and Andic Xerochrepts, plus shallow Typic Xeropsamments on granitic rocks. Soils at the higher elevations are mostly Lithic and Andic Cryumbrepts, plus shallow Typic Cryopsamments on granitic rocks. The soils are mostly well drained. Soil temperature regimes are mostly frigid, but some are cryic. Soil moisture regimes are mostly xeric. Soils have udic moisture regimes where snow persists through spring, melting to keep soils moist through much of the summer. Soils with aquic moisture regimes are present in glaciated terrain and small valleys, but they are not extensive.

Vegetation. The predominant natural plant communities are Jeffrey pine series, White fir series, Mixed subalpine forest series, and Red fir series. Lodgepole pine series occurs on some wet soils, and on drier soils where cold air drainage and frost limit the regeneration of other conifers. Singleleaf pinyon, Utah juniper, and Big sagebrush series prevail at lower elevations. Aspen series is common where drifted snow accumulates and provides water during summer. Sedge meadow communities are not extensive.

> **Characteristic series by lifeform include:**
> *Grasslands*: Ashy ryegrass series, Fen habitat, Nebraska sedge series, Montane meadow habitat, Mountain heather - bilberry series, Needle-and-thread series, Rocky Mountain sedge series, Rothrock sagebrush series, Shorthair reedgrass series, Shorthair sedge series, Subalpine meadow habitat.
> *Shrublands*: Big sagebrush series, Bitterbush series, Greenleaf manzanita series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series, Subalpine upland shrub habitat, Subalpine wetland shrub habitat, Tobacco brush series.
> *Forests and woodlands*: Aspen series, Jeffrey pine series, Lodgepole pine series, Mixed subalpine forest series, Red fir series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 35 to 45 inches; most of it falls as snow. Mean annual temperature is about 35° to 45° F. The mean freeze-free period is in the range from 25 to 75 days.

Surface Water. Runoff is rapid from most of the area. It flows to the Carson or Walker Rivers. Maximum flow in these rivers is during spring when snow is melting rapidly. There are many small natural lakes or ponds in glaciated terrain.

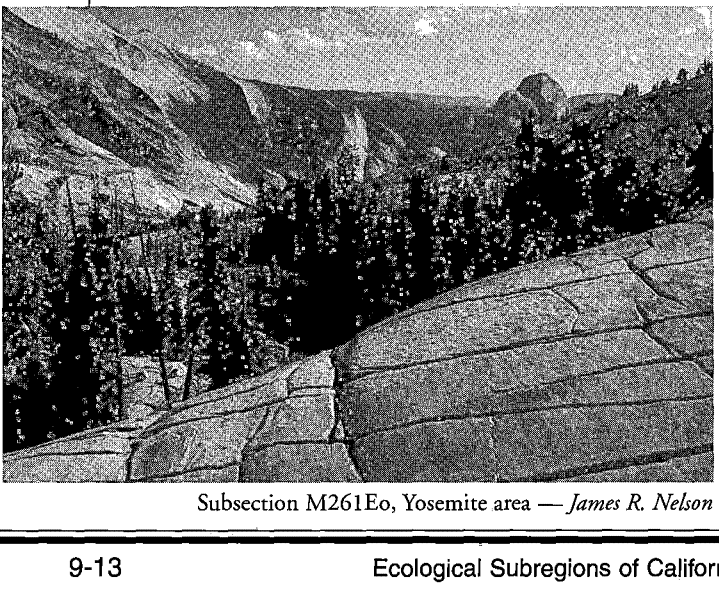
Subsection M261Eo Glaciated Batholith

This subsection is along the crest of the Sierra Nevada from Granite Dome just south of Sonora Pass southeast to Mt. Whitney. It has a cold to very cold and humid climate. MLRA 22d.

Lithology and Stratigraphy. Mesozoic granitic rocks predominate in this subsection. There are areas of pre-batholith rocks, too. The Mesozoic plutonic rocks are mostly adamellite, or quartz monzonite, and granodiorite, but they range from granite to gabbro. The pre-batholith rocks are mostly metamorphosed Jurassic and earlier marine sedimentary and volcanic rocks. There are a few small basalt flows. Pleistocene glacial till is common and there are small areas of Quaternary alluvium.

Geomorphology. This subsection is characterized by steep mountains at the northeastern edge of a plateau that is extensive west of the crest; some of the rolling plateau west of the crest is included in this subsection. The plateau surface is interrupted by the Cathedral and Ritter Ranges west and southwest of Mammoth Pass. Glacial erosion has modified most of the landforms. Cirques, aretes, cols, horns, and smooth, striated bedrock are common. The moraines have been modified by fluvial erosion. Some of the rivers flow in the bottoms of very steep sided canyons. The elevation ranges from about 6000 or 7000 feet up to 14495 feet on Mt. Whitney. Many peaks are higher than 12000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic and Andic Cryumbrepts; Dystric Xeropsamments; Typic



Subsection M261Eo, Yosemite area —*James R. Nelson*

Cryorthents; and Andic Haplumbrepts, plus Aquic Cryumbrepts in wet areas. Soils on glacial moraines are mostly Pachic and Typic Xerumbrepts. Much of the granitic rock is barren, lacking soil. The soils are mostly well drained, but those in wet meadows are somewhat poorly to poorly drained. Soil temperature regimes are mostly frigid and cryic. Soil moisture regimes are mostly xeric. Soils have udic moisture regimes where snow persists through spring, melting to keep soils moist through much of the summer. Soils with aquic moisture regimes are present in glaciated terrain and small valleys, but they are not extensive.

Vegetation. Most of this subsection is sparsely vegetated. The predominant natural plant communities are Mixed subalpine forest series and Red fir series, and communities of Subalpine meadow habitat. Jeffrey pine series are common on shallow and rocky soils at lower elevations. There is some Foxtail pine series at high elevations near the southwestern end of the subsection. Lodgepole pine series prevails on many wet soils and on drier soils where cold air drainage and frost limit the regeneration of other conifers. Sedge meadow communities are common.

Characteristic series by lifeform include:

Grasslands: Alpine habitat, Ashy ryegrass series, Fen habitat, Montane meadow habitat, Mountain heather - bilberry series, Nebraska sedge series, Needle-and-thread series, Rocky Mountain sedge series, Rothrock sagebrush series, Shorthair reedgrass series, Shorthair sedge series, Subalpine meadow habitat.

Shrublands: Bush chinquapin series, Greenleaf manzanita series, Huckleberry oak series, Mountain whitethorn series, Subalpine upland shrub habitat, Subalpine wetland shrub habitat, Tobacco brush series.

Forests and woodlands: Aspen series, Foxtail pine series, Jeffrey pine series, Limber pine series, Lodgepole pine series, Mixed subalpine forest series, Mountain hemlock series, Red fir series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 20 inches on the southeast to 60 inches on the northwest. Most of the precipitation is snow. Mean annual temperature is about 25° to 45° F. The mean freeze-free period is ranges from less than 10 to about 50 days.

Surface Water. Runoff is rapid from most of the area. Most of the runoff flows to the Stanislaus Rivers, Tuolumne, Merced, San Joaquin, Kings, or Kaweah on the west; to the Walker River, Mono Lake, or Owens Valley on the east; or to the Kern River on the south. Maximum flow in these rivers is during spring when snow is melting rapidly. There are many small natural lakes or ponds in glaciated terrain.

Subsection M261Ep Lower Batholith

This subsection comprises the mid-elevations of the western slope of the Sierra Nevada from El Portal on the Merced River southwest to the Greenhorn Mountains. It has a temperate and humid climate. MLRAs 22d and 22e.

Lithology and Stratigraphy. Mesozoic granitic, mainly adamellite and granodiorite, and pre-batholith rocks predominate in this subsection. The pre-batholith rocks are metamorphosed Jurassic rocks and older metavolcanic and metasedimentary rocks.

Geomorphology. This subsection is mostly on steep slopes along the lower, or southwest, edge of the extensive Sierra Nevada plateau, and on steep mountains in the Greenhorn Mountain range. Several large rivers from the Merced to the Kings Rivers cross the subsection. These rivers and some of their tributaries flow in the bottoms of very steep sided canyons. The canyon of the Kings River is about 4000 feet deep where it enters this subsection. The elevation ranges from about 3000 feet, or less along the Kings River, to about 6500 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric and shallow Dystric Xerochrepts; Ultic Haploxeralfs; and Entic Ultic, Pachic, Pachic Ultic, and shallow Entic Haploxerolls on granitic rocks. Also, Dystric Lithic Xerochrepts; Haploxerolls; and Typic Haploxerults are common on metamorphic rocks. The soils are mostly well drained. Soil temperature regimes are mostly mesic. Soil moisture regimes are xeric.

Subsection M261Ep, Shell Mountain area — *Robert Ettner*

Vegetation. The predominant natural plant communities are Ponderosa pine series at lower elevations and Mixed conifer series at higher elevations. In deep canyons, Canyon live oak series is common on very steep rocky slopes and Manzanita chaparral and Mixed chaparral shrublands are common on shallow soils. Most of the groves containing the Giant sequoia series occur in this subsection.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, California oatgrass series, Montane meadow habitat, Needle-and-thread series.

Shrublands: Brewer oak series, Chamise series, Deerbrush series, Greenleaf manzanita series, Interior live oak series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Birchleaf mountain-mahogany series, Black oak series, Canyon live oak series, Incense-cedar series, Mixed conifer series, Ponderosa pine series, Giant sequoia series, White fir series.

Climate. The mean annual precipitation is about 30 to 60 inches; much of it falls as snow. Mean annual temperature is about 45° to 55° F. The mean freeze-free period is in the range from 100 to 150 days.

Surface Water. Runoff is rapid; it flows to the Merced, San Joaquin, Kings, Kaweah, Tule, or Kern Rivers or tributaries of them. Maximum flow in these rivers is during spring when snow is melting rapidly. There are no natural lakes, but there are some reservoirs.

Subsection M261Eq
Upper Batholith

This subsection comprises the higher elevations of the western slope of the Sierra Nevada from the Grand Canyon of the Tuolumne River south-southwest to Slate Mountain, which is on the drainage divide west of the Kern River. It has a cold and humid climate. MLRA 22e.

Subsection M261Eq, Black Peak area — *Robert Ettner*

Lithology and Stratigraphy. Mesozoic granitic rocks predominate in this subsection; pre-batholith metamorphic rocks are common, but post-batholith volcanic rocks are sparse. Pleistocene glacial till and outwash are common in the northern part to sparse in the southern part of the subsection. There are small areas of Quaternary alluvial and lacustrine deposits.

Geomorphology. This subsection is on a gently sloping to moderately steep plateau with some steep mountains on it. Glacial erosion has modified most of the valleys. Several large rivers between the Tuolumne and Tule Rivers head in or cross the subsection. Some of these rivers flow in the bottoms of very steep sided canyons. The elevation ranges about 6000 to 10000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric Xeropsamments; Dystric Xerorthents; Dystric Xerochrepts; and Entic, Typic, and Pachic Xerumbrepts, plus Aquic Cryumbrepts in wet areas. There are some Cryumbrepts at the highest elevations. The soils are mostly well drained. Soil temperature regimes are mostly frigid, but some are cryic. Soil moisture regimes are mostly xeric. Soils have udic moisture regimes where snow persists through spring, melting to keep soils moist through much of the summer. Soils with aquic moisture regimes are present in glaciated terrain and small valleys, but they are not extensive.

Vegetation. The predominant natural plant communities, from lower to higher elevations, are Mixed conifer series, White fir series, and Red fir series. Jeffrey pine series is common on shallow and rocky soils. Lodgepole pine series prevails on many wet soils and on drier soils where cold air drainage and frost limit the regeneration of other conifers. Sedge meadow communities are common, but they are not extensive. Some groves of Giant sequoia series occur at lower elevations in this subsection.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, California oatgrass series, Montane meadow habitat, Needle-and-thread series.

Shrublands: Brewer oak series, Chamise series, Deerbrush series, Greenleaf manzanita series, Interior live oak series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Giant sequoia series, Incense-cedar series, Jeffrey pine series, Lodgepole pine series, Mixed conifer series, Red fir series, White fir series.

Climate. The mean annual precipitation is about 40 to 60 inches; most of it falls as snow. Mean annual temperature is about 35° to 50° F. The mean freeze-free period is about 25 to 100 days.

Surface Water. Runoff is rapid from most of the area. Most of the runoff flows to the Tuolumne, Merced, San Joaquin, Kings, Kaweah, Tule, or Kern Rivers or tributaries of them. Maximum flow in these rivers is during spring when snow is melting rapidly. There are many small natural lakes or ponds in glaciated terrain, and some reservoirs.

Subsection M261Er Eastern Slopes

This subsection comprises the very steep eastern slope of the Sierra Nevada from Eagle Peak west of Bridgeport south to the Tehachapi Pass area. It includes South Fork Valley of the Kern River system, most of the Scodie (or Kiavah) Mountains, and Kelso Valley. It has a hot to very cold and arid to humid climate. MLRAs 22e and 29f.

Lithology and Stratigraphy. Mesozoic granitic predominate in this subsection, but there are large areas of pre-batholith sedimentary and metamorphic rocks. Volcanic rocks are sparse; the largest exposure being Pleistocene basalt and pyroclastic rocks at Crater Mountain on the west side of Owens Valley, near Poverty Hill. Pleistocene glacial till and outwash are common in the northern part of the subsection. Quaternary alluvium is extensive only in Kelso and South Fork Valleys near the southern end of the Sierra Nevada.

Subsection M261Er, Lone Pine area — *Robert Ettner*

Geomorphology. This subsection is characterized by very steep fault-line scarp and steep mountains. Slopes are gently sloping to moderately steep on Quaternary volcanic rocks, which are not extensive, and very gently to moderately sloping on Quaternary alluvial fans and basin floors. Glacial erosion has modified much of the northern part of the subsection. Cirques, aretes, cols, and horns are common there. The rivers, except some of those in glaciated terrain, flow through very steep sided V-shaped canyons. The elevation ranges about 2500 to 10,000 feet. Faulting, mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are Lithic Torriorthents; Typic and shallow Xeric Torripsamments; shallow Typic Xeropsamments; Aridic, Torriorthentic, and shallow Entic Haploxerolls; shallow Typic Cryopsamments; Andic and Lithic Cryumbrepts; Typic Argixerolls; and Ultic Haploxeralfs. Vitrandic Torriorthents are common on Crater Mountain. Soils in Kelso and South Fork Valleys are mostly Xeric Torripsamments and Xerollic Haplargids. The soils are mostly well drained. Soil temperature regimes are thermic, mesic, frigid, and cryic. Soil moisture regimes are mostly xeric on the north to aridic on the south end of the subsection. Soils may have udic moisture regimes where snow persists through spring, melting to keep soils moist through much of the summer.

Vegetation. The predominant natural plant communities northwest of Round Mountain are Jeffrey pine series, White fir series, Mixed subalpine forest series, and Red fir series, with Big sagebrush series at lower and communities of Subalpine meadow habitat at higher elevations. South of about Wonoga Peak, near Owens Lake, they are mainly Singleleaf pinyon series and lesser amounts of Black bush series. Also, there are Joshua tree series, California buckwheat series, and Mixed scrub shrublands at the south end of the Sierra Nevada, and Needlegrass grasslands in South Fork Valley.

Greenleaf manzanita series, Joshua tree series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series, Subalpine upland shrub habitat, Subalpine wetland shrub habitat, Tobacco brush series.

Forests and woodlands: Aspen series, Jeffrey pine series, Lodgepole pine series, Mixed subalpine forest series, Piute cypress stands, Red fir series, Singleleaf pinyon series, White fir series.

Climate. The mean annual precipitation is about 8 to 50 inches. Most of the precipitation is snow at higher elevations. Mean annual temperature is about 35° to 60° F. The mean freeze-free period is about 25 to 200 days.

Surface Water. Runoff is rapid from most of the area. It flows to closed basins in the Basin and Ranges, or, from the south end of the subsection, to the Kern River. There are many small natural lakes or ponds in glaciated terrain.

Subsection M261Es Tehachapi - Piute Mountains

This subsection is the southern end of the Sierra Nevada. It includes most of the Tehachapi and Piute Mountains. It has a hot to cold and semi-arid to subhumid climate. MLRAs 18e and 22d.

Lithology and Stratigraphy. Mesozoic granitic rocks predominate in this subsection, but there are some areas of pre-batholith metamorphic rocks. There is a large area post-batholith volcanic rocks, mostly Miocene and Pliocene, on and around Emerald Mountain. Quaternary alluvium is extensive in Walker, Tehachapi, Cummings, and Bear Valleys.

Geomorphology. This subsection is characterized by steep mountains. Many ridges are slightly elongated with many different orientations, but those in the Piute Mountains are generally aligned near north-south and those in the Tehachapi Mountains are generally aligned near east-west. There is a small area of rolling plateau surface above 6000 feet in the Piute Mountains. Slopes are gently sloping to moderately steep on Quaternary volcanic rocks, which are not extensive, and nearly level to moderately sloping on Quaternary alluvial fans and basin floors. The elevation ranges from about 3500 up to 7981 feet on Double Mountain in the Tehachapi Mountains and 8318 feet in the Piute Mountains. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic and Pachic Haploxerolls and Lithic and Typic Argixerolls. There are Umbrepts at higher elevations in the Piute Mountains, but they are not extensive. Soils are mostly Xeric Torripsamments and Xeralfic Haplargids in Walker Basin and Mollic Xerofluvents and Typic and Pachic Argixerolls in the other large valleys. The soils are well drained. Soil temperature regimes are mostly thermic and mesic, but frigid at the highest elevations. Soil moisture regimes are mostly xeric, but aridic in Walker Basin.

Vegetation. The predominant natural plant communities are Blue oak series, and Singleleaf pinyon series on the southeast edge of the subsection and north of Walker Basin. Canyon live oak series is common on very steep rocky slopes and Mixed chaparral shrublands are common on shallow soils. There is some Ponderosa pine series on Breckenridge Mountain and some Jeffrey pine series and White fir series in the higher parts of the Piute and Tehachapi Mountains. Black oak series and Valley oak series are common on mountain footslopes and in valleys.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Montane meadow habitat.

Shrublands: Brewer oak series, Chamise series, Deerbrush series, Greenleaf manzanita series, Interior live oak series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Birchleaf mountain-mahogany series, Black oak series, Blue oak series, Canyon live oak series, Fox pine series, Jeffrey pine series, Piute cypress stands, Ponderosa pine series, Singleleaf pinyon series, Valley oak series, White fir series.

Climate. The mean annual precipitation is about 12 to 30 inches. Most of the precipitation is snow at higher elevations. Mean annual temperature is about 42° to 56° F. The mean freeze-free period is in the range from 75 to 175 days.

Surface Water. Runoff is rapid from most of the area. It flows to the Kern River or to closed basins in the southern end of the Great Valley or in the Mojave Desert. All streams are dry through the summer. There are no natural lakes or ponds in the subsection.

Subsection M261Es, near Tehachapi — *Charles B. Goudey*

Subsection M261Et Carson Range

This subsection is a mountain range east and northeast of lake Tahoe. It has a cold to very cold and semi-arid to subhumid climate. MLRAs 22e and 22f.

Lithology and Stratigraphy. Mesozoic granitic rocks and, in the northern part of the subsection, Tertiary andesite and lahar predominate in this subsection. There are some pre-batholith metamorphic rocks, too. Pleistocene glacial till and outwash are common on both sides of the Carson Range. There is little Holocene alluvium.

Geomorphology. Steep mountain slopes predominate in this subsection. The Carson Range is elongated parallel to high-angle, or normal, faults and is aligned north-south. There is small area of gently to moderately sloping subsummit plateau at the north end of the Carson Range. Also, there are small areas of gently sloping to moderately steep glacial moraines and nearly level to moderately sloping outwash plain, floodplain, and alluvial fans. The elevation ranges from 5500 or 6000 feet at the northern end of the Carson range, or 6230 feet along the shore of Lake Tahoe, up to 10776 feet on Mt. Rose and 10881 feet on Freel Peak. Faulting, mass wasting, and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly shallow Typic and Dystric Xeropsamments; shallow Typic Cryopsamments; Typic Cryorthents; Typic, Entic, and Andic Xerumbrepts; Lithic, Typic, and Entic Cryumbrepts; and, around the north end of the Carson Range, Aridic Pachic Haploxerolls and Aridic Argixerolls. Mollic Cryoboralfs are common on the subsummit plateau, with Humic Cryaquepts in swales. Soils on moraines are mostly Entic and Pachic Xerumbrepts. The soils are mostly well drained; poorly drained soils are not extensive. Soil temperature regimes are mostly frigid and cryic. Soil moisture regimes are mostly xeric, but aridic at lower elevations at the north end of the Carson Range.

Vegetation. The predominant natural plant communities are Jeffrey pine series and White fir series at lower elevations. At higher elevations, there is Red fir series and, on north-facing slopes, small areas of Mountain hemlock series. Whitebark pine series is common at the highest elevations. Sedge meadow communities and Willow thickets predominate in wet areas, with Lodgepole pine series around the margins of wet areas.

> **Characteristic series by lifeform include:**
> *Grasslands*: Alpine habitat, Ashy ryegrass series, Montane meadow habitat, Nebraska sedge series, Needle-and-thread series, Rocky Mountain sedge series.
>
> *Shrublands*: Big sagebrush series, Bitterbush series, Greenleaf manzanita series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series, Tobacco brush series.
>
> *Forests and woodlands*: Jeffrey pine series, Lodgepole pine series, Mountain hemlock series, Red fir series, Washoe pine series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 15 to 40 inches; most it falls as snow. Mean annual temperature is about 35° to 45° F. The mean freeze-free period is about 25 to 100 days.

Surface Water. Runoff is rapid from most of the area. The runoff flows to the Carson River, Truckee River, or Lake Tahoe, which is drained by the Truckee River.

Subsection M261Et, Fountain Place area — *James R. Nelson*

Subsection M261Eu Kern Plateau

This subsection is a high plateau west of the main crest of the Sierra Nevada. It is between the Kern Canyon Fault and the eastern slope of the Sierra Nevada from near Golden Trout Creek south to South Fork Valley. The higher part of the Scodie Mountains is included in this subsection. It has a temperate to cold and semi-arid to subhumid climate. MLRA 22e.

Lithology and Stratigraphy. Mesozoic granitic rocks predominate in this subsection. Also, pre-batholith metamorphic rocks are moderately extensive. Monache and Templeton Mountains are small Tertiary andesitic cones. There are small Pleistocene basalt flows along Golden Trout Creek and the South Fork of the Kern River and two cinder cones associated with them. Quaternary alluvium is common in small areas along streams, but Pleistocene glacial till is sparse.

Subsection M261Eu, Manter Meadow area
on Kern Plateau — *Robert Ettner*

Geomorphology. This subsection is characterized by gentle to moderately steep slopes on a rolling plateau and steep to very steep slopes in the canyon of the Kern River and on edges of the plateau. The Kern River runs from north to south in nearly a straight line along the Kern Canyon Fault. The plateau is not deeply incised, except near the edge of it and along the Kern River. The subsection elevation ranges from about 3000 or 4000 feet up to 11371 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Dystric Xeropsamments; Dystric and shallow Typic Xerorthents; Dystric Xerochrepts; Typic, Ultic, Pachic, and shallow Entic Haploxerolls; and, in the southeastern part of the subsection, shallow Xeric Torripsamments, Torriorthentic Haploxerolls, and Aridic Argixerolls. There are Andic Xerumbrepts and Typic Vitrandepts on the volcanic rocks of Templeton and Monache Mountains. The soils are well drained. Soil temperature regimes are mostly mesic and frigid. Soil moisture regimes are mostly xeric, but some are aridic.

Vegetation. The predominant natural plant communities are Jeffrey pine series, Mixed conifer series, and White fir series, and, in the southeastern part of the subsection, Singleleaf pinyon series. Canyon live oak series and Mixed chaparral shrublands occur on very steep rocky slopes along the Kern River and the southern edge of the plateau. Sedge meadow communities are common, but not extensive.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, Montane meadow habitat, Nebraska sedge series, Needle-and-thread series, Rocky Mountain sedge series.

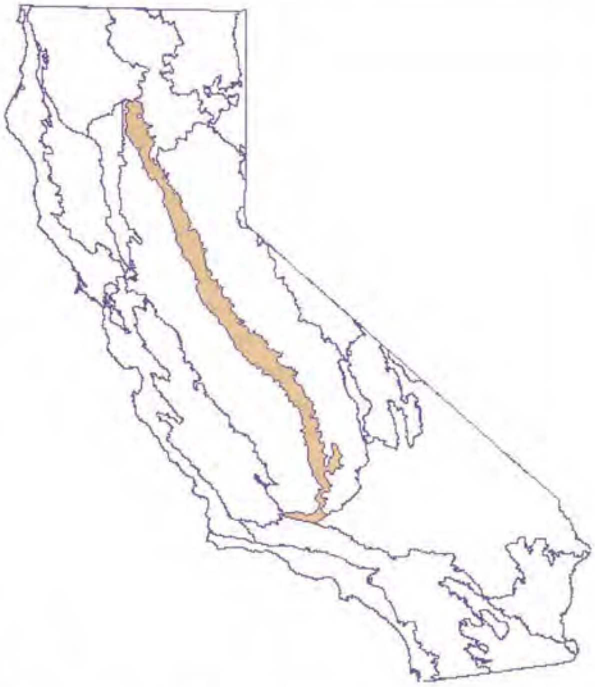
Shrublands: Brewer oak series, Chamise series, Deerbrush series, Greenleaf manzanita series, Interior live oak series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Birchleaf mountain-mahogany series, Canyon live oak series, Foxtail pine series, Incense-cedar series, Jeffrey pine series, Mixed conifer series, Singleleaf pinyon series, White fir series.

Climate. The mean annual precipitation is about 10 to 30 inches. Most of the precipitation is snow at higher elevations. Mean annual temperature is about 35° to 55° F. The mean freeze-free period is about 25 to 150 days.

Surface Water. Runoff is rapid from most of the area. It flows through the Kern River to a closed basin in the southern end of the Great Valley. Maximum flow in the streams is during spring when snow is melting rapidly. There are very few small natural lakes or ponds in the subsection, but many on the same plateau further up in the Kern River basin.

CHAPTER 10



Section M261F
Sierra Nevada Foothills

This section comprises the hot foothills of the Sierra Nevada, and the southwestern end of the Cascade Ranges, adjacent to the Great Valley. Summers are hot and dry and winters are mild. MLRA 18.

Geomorphology. Block mountain range tilted west; accordant crests. Sierra Nevada Range geomorphic province.

Lithology. Mesozoic sedimentary, granitic, volcanic and ultramafic rocks.

Soil Taxa. Alfisols, Aridisols, Entisols, Inceptisols, Mollisols and Vertisols in combination with mostly thermic soil temperature regimes and xeric or aridic soil moisture regimes.

Vegetation. Predominant potential natural communities include the Blue oak series, Needlegrass grasslands, Chamise series, Mixed chaparral series, Foothill pine series and Valley oak series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Broom series, California annual grassland series, Cheatgrass series, Gaint reed series, Introduced perennial grassland series, Kentucky bluegrass series and Tamarisk series.
>
> *Series that can occur in all subsections, but are not extensive*: Bulrush series, Bulrush - cattail series, Cattail series, Common reed series, Deerbrush series, Duckweed series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Purple needlegrass series, Quillwort series, Sedge series, Spikerush series and Tufted hairgrass series, .
>
> *Series restricted to riparian settings*: Arroyo willow series, Black willow series, Buttonbush series, California sycamore series, Fremont cottonwood series, Mixed willow series, Narrowleaf willow series, Mulefat series, Pacific willow series, Red willow series and White alder series.

Fauna. Former inhabitants include grizzly bear and pronghorn antelope. Mammals include black-tailed and mule deer, coyotes, ground squirrels, cottontails, jack rabbits and kangaroo rats. Common birds include turkey vultures, falcons, eagles, hawks, owls, quail, mourning dove, mockingbird, scrub jay, herons, ravens, western meadow lark, finches and sparrows. Introduced species include turkeys and chukars.

Elevation. 200 to 5000 feet.

Precipitation. 8 to 40 inches.

Temperature. 45° to 64°F.

Growing Season. 150 to 300 days

Surface Water Characteristics. Many rapid flowing rivers and streams. Rivers flow westerly in deeply incised canyons with bedrock controlled channels to the Great Valley section and Pacific Ocean. Reservoirs for municipal water supply, irrigation and flood control are common.

Section M261F, White River area east of Delano — *Robert Ettner*

Disturbance Regimes.
Fire: Fires are low, moderate and high intensity surface or stand replacing fires.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to mining, grazing and agriculture. Rapidly expanding foothill urban areas are scattered throughout the section. Large and small water impoundments are common.

Cultural Ecology. Humans have been utilizing the section for about 10,000 years, and have been an integral part of its ecology for 3,000 to 5,000 years. Sierran foothills contain some of the densest year-round prehistoric habitation locations in California, particularly along riparian areas, where intensive occupation, resource procurement and processing practices, and vegetation manipulation ofttimes altered the environment. Contemporary attitudes tend to be dichotomized between amenity/newcomer and commodity/long-time resident values. Human environment is characterized by a rural lifestyle of open space and out-door leisure activity. Recreation is the primary economic emphasis, trailed by government employment. The foothills, in particular, are experiencing rapid retiree and commuter resident growth.

Subsections. The Sierra Nevada Foothills section is divided into 5 subsections.

Subsection M261Fa Tuscan Flows

This subsection is a relatively low elevation volcanic plateau at the northeast end of the Sacramento Valley. The southwesterly sloping plateau is at the extreme southwest end of the Cascade Ranges. It is included in the Sierra Nevada Foothills section because of ecosystem similarities. The climate is hot and subhumid. MLRA 18d.

Subsection M261Fa, Battle Creek area near Darrah State Hatchery — *Robert Ettner*

Lithology and Stratigraphy. Late Pliocene and Quaternary basalt, andesite, and andesitic lahars dominate this subsection. Some of the basalt is Holocene. Small areas of Cretaceous marine and Eocene nonmarine sediments are exposed beneath the flows. There is some Quaternary alluvium in valleys.

Geomorphology. This subsection is on a very gently to gently sloping plateau with a few moderately steep to steep volcanic cones on it. There are several Holocene cinder cones. Where the plateau is dissected, canyon sideslopes are steep to very steep. Some of the larger canyons have floodplains and terraces in them. The subsection elevation range is about 200 to 2000 feet on the plateau surface and up to 3103 on Inskip Hill. Fluvial erosion is the main geomorphic processes.

Soils. The soils are mostly Lithic Ruptic - Xerorthentic Xerochrepts, Typic Rhodoxeralfs, and Pachic Argixerolls. Those on sedimentary rocks are mostly Lithic Xerochrepts and Entic Chromoxererts. Typic Xerofluvents, Typic Xerochrepts, Mollic Haploxeralfs, Typic Durixeralfs, and Typic Palexeralfs are common on floodplains and terraces. The soils are well drained. Bicarbonate weathering and leaching and accumulation of clay and silica in subsoils are the main pedogenic processes. Soil temperature regimes are thermic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant community is Blue oak series. Needlegrass grasslands predominate on the Vertisols and shallow soils. Northern basalt flow and Northern volcanic mudflow vernal pool habitats occur in this subsection.

Characteristic series by lifeform include:

Vernal pools: Northern basalt flow vernal pool.

Grasslands: California annual grassland series.

Shrublands: Interior live oak shrub series, Scrub oak series, Wedgeleaf ceanothus series.

Forests and woodlands: Birchleaf mountain-mahogany series, Blue oak series, Foothill pine series, Interior live oak series, Knobcone pine series, McNab cypress series, Valley oak series.

Climate. The mean annual precipitation is about 20 to 40 inches. It is practically all rain. Mean annual temperature is about 56° to 64° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Streams in this subsection drain to the Sacramento River. All but the larger streams are generally dry during the summer. There are no natural lakes.

Subsection M261Fb Lower Foothills Metamorphic Belt

This subsection is the lower elevation western edge of the Sierra Nevada from the northwest end of the Sierra Nevada southeastward to just beyond the Merced River. It has a hot and subhumid climate. MLRA 18d.

Lithology and Stratigraphy. Mainly Jurassic and Paleozoic marine sedimentary and metavolcanic rocks; some Mesozoic granitic rocks; and minor Eocene and Pliocene basalt and andesite occur in this subsection. Ultramafic rocks are common along faults. There is very little Tertiary sedimentary rock and Quaternary alluvium.

Geomorphology. This subsection is on moderately steep to steep mountains and hills at the western foot of the Sierra Nevada. All of the northern part and most of the southern part of the subsection is west of the Melones Fault Zone. West of this fault zone the western slope of the Sierra Nevada does not appear as a plateau, except on a few plutons, but as a series of northwest to north-northwest aligned ridges that decline in elevation from northeast to southwest. Major rivers cut across the ridges to form a trellis drainage pattern, although it is not a distinct pattern. Alluvial fans, floodplains, and terraces are not extensive. The subsection elevation range is about 300 to 3000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic and Ruptic - Lithic Xerochrepts; Mollic and Ultic Haploxeralfs; and Lithic Xerorthents. Those on ultramafic rocks are mostly Mollic Haploxeralfs and Lithic Argixerolls. The soils are well drained. Bicarbonate weathering and leaching and accumulation of clay in subsoils are the main pedogenic processes. Soil temperature regimes are mostly thermic. Soil moisture regimes are xeric.

Subsection M261Fb, west of Auburn — *Robert Ettner*

Vegetation. The predominant natural plant community is Blue oak series. Also, there are some Needlegrass grasslands, Chamise series on shallow and rocky soils, and Valley oak series in valleys.

Characteristic series by lifeform include:

Vernal pools: Northern claypan vernal pools.

Grasslands: California annual grassland series.

Shrublands: Chamise series, Chamise - wedgeleaf ceanothus series, Interior live oak shrub series, Scrub oak series, Wedgeleaf ceanothus series, White manzanita series.

Forests and woodlands: Birchleaf mountain-mahogany series, Black oak series, Blue oak series, Foothill pine series, Interior live oak series, Ione manzanita series, Mixed oak series, Valley oak series.

Climate. The mean annual precipitation is about 20 to 40 inches. It is practically all rain. Mean annual temperature is about 52° to 62° F. The mean freeze-free period is about 225 to 300 days.

Surface Water. The Feather, Yuba, American, Cosumnes, Mokelumne, Stanislaus, Tuolumne, and Merced Rivers cross this subsection. Runoff is rapid to these rivers and their tributaries. All but the larger streams are generally dry during the summer. There are no natural lakes, but many reservoirs.

Subsection M261Fc Lower Granitic Foothills

This subsection is the lower elevation western edge of the Sierra Nevada from Guadalupe Mountains south-eastward to Blue Mountain, west of the Greenhorn Mountains. It has a hot and subhumid climate. MLRAs 18d and 18e.

Lithology and Stratigraphy. Mesozoic granitic rocks predominate in this subsection. Also, there are some Mesozoic mafic plutonic and Jurassic and older metavolcanic and metasedimentary rocks. A large body of ultramafic rock is exposed near the Kings River. There is very little Tertiary sedimentary rock and Quaternary alluvium.

Geomorphology. This subsection is on moderately steep to steep mountains and hills at the western, or southwestern, foot of the Sierra Nevada. There is little faulting, compared to the Lower Foothill Metamorphic Belt (M261Fb), and northwest to north-northwest aligned ridges are much less common and less distinct. Ridges are more commonly aligned toward the southwest, parallel to major rivers that flow off the western slope of the Sierra Nevada. Alluvial fans, floodplains, and terraces are not extensive. The subsection elevation range is about 400 to 4000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Mollic Haploxeralfs; Typic Xerochrepts; and shallow Typic Xerorthents. Those on ultramafic rocks are mostly Mollic Haploxeralfs. Typic Chromoxererts and Typic Rhodoxeralfs are common on mafic plutonic rocks, such as gabbro. The soils are well drained. Bicarbonate weathering and leaching and accumulation of clay in subsoils are the main pedogenic processes. Soil temperature regimes are mostly thermic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant community is Blue oak series. Also, there are some Needlegrass grasslands, Chamise series on shallow and rocky soils, and Valley oak series in valleys.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Chamise series, Chamise - wedgeleaf ceanothus series, Interior live oak shrub series, Scrub oak series, Wedgeleaf ceanothus series, White manzanita series.

Forests and woodlands: Birchleaf mountain-mahogany series, Blue oak series, Brewer oak series, California buckeye series, Foothill pine series, Interior live oak series, Mixed oak series, Valley oak series.

Climate. The mean annual precipitation is about 18 to 30 inches. It is practically all rain. Mean annual temperature is about 52° to 64° F. The mean freeze-free period is about 225 to 300 days.

Surface Water. The San Joaquin, Kings, Kaweah, and Tule Rivers cross this subsection. Runoff is rapid to these rivers and their tributaries. All but the larger streams are generally dry during the summer. There are no natural lakes, but many reservoirs.

Subsection M261Fd Southern Granitic Foothills

This subsection comprises the lower slopes around the southern end of the Greenhorn Mountains and on the western sides of Breckenridge Mountain and the Tehachapi Mountains. Hot Spring Valley along the Kern River and the lower part of South Fork Valley are included in this subsection. It has a hot and semi-arid to subhumid climate. MLRA 18e.

Lithology and Stratigraphy. Mesozoic granitic rocks predominate in this subsection. Also, there are some

Subsection M261Fc, White River area east of Delano — *Robert Ettner*

Subsection M261Fd, Kern Canyon near Gold Ledge Creek — *Robert Ettner*

Mesozoic mafic plutonic and pre-batholith metamorphic rocks. There is Quaternary alluvium in Linns, Hot Spring, and South Fork Valleys and a few other small valleys.

Geomorphology. This subsection is mostly on moderately steep to steep mountains and hills. Major valleys are aligned east-west or toward the south-south west parallel to the Breckenridge Fault. Ridges at the northwestern end of the Tehachapi mountains curve from east-west around toward the west-northwest. Alluvial fans, floodplains, and basin floors are important, but not extensive, parts of the subsection. The subsection elevation range is about 1000 to 5000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic and Pachic Haploxerolls; shallow Typic Xerorthents; and Lithic and Typic Argixerolls. Xerochrepts are common on metamorphic rocks. Soil in the larger valleys are mostly Xeric Torripsamments and Xeralfic Haplargids. The soils are well drained. Bicarbonate weathering and leaching and accumulation of clay in subsoils are the main pedogenic processes. Calcium carbonates accumulate in some soils. Soil temperature regimes are mostly thermic. Soil moisture regimes are mostly xeric, but aridic in at least South Fork Valley and possibly in other valleys.

Vegetation. The predominant natural plant community is Blue oak series. Also, there are some Needlegrass grasslands, Chamise series on shallow and rocky soils, and Valley oak series in valleys.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Allscale series, Bladderpod - California ephedra - narrowleaf goldenbush series, Chamise series, Chamise - wedgeleaf ceanothus series, Chaparral whitethorn series, Interior live oak shrub series, Scalebroom series, Scrub oak series, Wedgeleaf ceanothus series, White manzanita series.

Forests and woodlands: Birchleaf mountain-mahogany series, Blue oak series, California buckeye series, Foothill pine series, Interior live oak series, Mixed oak series, Valley oak series.

Climate. The mean annual precipitation is about 8 to 25 inches. It is practically all rain. Mean annual temperature is about 50° to 64° F. The mean freeze-free period is about 200 to 300 days.

Surface Water. Runoff is rapid from most of the subsection. It flows to closed basins in the southern end of the Great Valley. All but the larger streams are generally dry during summer. There are no natural lakes, but some reservoirs.

Subsection M261Fe
San Emigdio Mountains

This subsection comprises the San Emigdio Mountains and the southwest end of the Tehachapi Mountains at the southern end of the Great Valley. The San Andreas Fault is the southern boundary of this subsection. It has a hot and semi-arid to subhumid climate. MLRA 18e.

Lithology and Stratigraphy. Mesozoic granitic rocks predominate in this subsection. Also, there are some pre-batholith metamorphic rocks. Adjacent to the Great Valley there are Eocene, Oligocene, and Miocene sedimentary rocks. There is Quaternary alluvium in Castaic Valley and a few other small valleys.

Geomorphology. This subsection is mostly on moderately steep to steep mountains and hills. The east-northeast aligned Garlock Fault meets the west-northwest aligned San Andreas Fault on the southern margin of this subsection. Ridges adjacent to these faults are aligned parallel to them. Most other ridges point to the Great Valley, which is the direction that the larger streams flow. Alluvial fans, floodplains, and basin floors are not extensive. The subsection elevation range is from about 2000 feet up to 7495 feet on San Emigdio Mountain. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic and Dystric Xerochrepts; shallow Typic Xerorthents; Typic and Pachic Haploxerolls; Ultic Haploxerolls; and Pachic Argixerolls on granitic rocks. They are mostly Calcic Haploxerolls and Typic Argixerolls on Tertiary sedimentary rocks, which happen to be at lower elevations than most of the granitic rocks. The soils are well drained. Bicarbonate weathering and leaching and accumulation of clay in subsoils are the main pedogenic processes. Calcium carbonates accumulate in some soils on Tertiary sedimentary rocks. Soil temperature regimes are thermic and mesic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant community is Blue oak series, with Ponderosa pine series and Jeffrey pine series at higher elevations. Also, there are some Needlegrass grasslands, Canyon live oak series on steep canyon slopes, Chamise series and Mixed chaparral shrublands on shallow and rocky soils, and Valley oak series in valleys.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Allscale series, Bladderpod - California ephedra - narrowleaf goldenbush series, Chamise series, Chamise - wedgeleaf ceanothus series, Chaparral whitethorn series, Interior live oak shrub series, Scalebroom series, Scrub oak series, Wedgeleaf ceanothus series, White manzanita series.

Forests and woodlands: Birchleaf mountain-mahogany series, Blue oak series, California buckeye series, Canyon live oak series, Foothill pine series, Interior live oak series, Jeffrey pine series, Mixed oak series, Ponderosa pine series, Valley oak series.

Climate. The mean annual precipitation is about 10 to 20 inches. It is practically all rain. Mean annual temperature is about 45° to 60° F. The mean freeze-free period is about 150 to 250 days.

Surface Water. Runoff is rapid from most of the subsection. It flows to closed basins in the southern end of the Great Valley. The streams are generally dry during the summer. There are no natural lakes.

CHAPTER 11

Section M261G Modoc Plateau

This section corresponds to most of the Modoc Plateau, which is related structurally to the Basin and Range Province and lithologically to the Columbia Plateau. It is in MLRAs 21.

Geomorphology. Northwesterly trending fault-block mountains and ridges with intervening basin-like grabens commonly interspersed with lake bed deposits, shield volcanoes, cinder cones or lava flows. Modoc Plateau geomorphic province (part of the Basin and Range province flooded with volcanics related to those of the Cascade Ranges province).

Lithology. Cenozoic volcanic and nonmarine sedimentary rocks and alluvial deposits.

Soil Taxa. Alfisols, Andisols, Aridisols, Entisols, Histisols, Inceptisols, Mollisols and Vertisols in combination with mesic, frigid or cryic soil temperature regimes and xeric, aquic or aridic soil moisture regimes.

Vegetation. Predominant potential natural communities include the Big sagebrush series, Western juniper series, Idaho fescue series, Bluebunch wheatgrass series, Ponderosa pine series, White fir series, Low sagebrush series, Jeffrey pine series, Lodgepole pine series, Aspen series and sedge meadow communities.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Cheatgrass series, Crested wheatgrass series, Introduced perennial grassland series and Kentucky bluegrass series.
>
> *Series that can occur in all subsections, but are not extensive*: Bulrush series, Bulrush - cattail series, Bur-reed series, Cattail series, Duckweed series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Sedge series, Spikerush series and Yellow pond-lily series.
>
> *Series restricted to riparian settings*: Arroyo willow series, Black cottonwood series, Mixed willow series, Montane wetland shrub habitat, Narrowleaf willow series, Mixed willow series, Red willow series and Subalpine wetland shrub habitat.

Fauna. Mammals include mule deer, pronghorn, black bear, mountain lion, coyote, bobcat, yellow-bellied marmot, wolverine, jack rabbit and porcupine. Birds include eagles, hawks, owls, woodpeckers, falcons, osprey, quail and sage grouse. The section contains wetlands that are important resting, feeding and nesting areas for migrating waterfowl. Species of concern include the California and spotted owl (western part). Species no longer occurring in the section include mountain sheep and sharp-tailed grouse.

Elevation. 3000 to 9900 feet.

Precipitation. 8 to 30 inches.

Temperature. 35° to 52°F.

Growing Season. 25 to 150 days.

Surface Water Characteristics. Few slow flowing rivers and few slow to moderately rapid flowing streams,

Section M261G, Pit River Valley near Canby — *Robert Ettner* although most streams do not flow throughout the summer. Rivers and streams flow in alluvial and bedrock controlled channels to the Sacramento and Klamath Rivers, or to basins within the Modoc Plateau or the Northwestern Basin and Range section. Numerous small to very large lakes and reservoirs occur throughout the section.

Disturbance Regimes.
Fire: Historic occurrence has changed from frequent, low intensity ground fires to infrequent, high intensity stand replacing fires.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to grazing, forestry and agriculture.

Cultural Ecology. Humans have been utilizing the plateau for about 10,000 years, and have been an integral part of its ecology for 3,000 to 5,000 years. Extensive prehistoric procurement and processing of obsidian resources have left vast areas of the plateau pockmarked and littered with lithic debitage. Euroamerican influx into the area in the mid-1800's, along the Oregon and California Trails, ushered in agricultural pursuits. Contemporary attitudes and beliefs tend to be dominated by commodity oriented long-time resident values and a rural lifestyle. The economy is dominated by government employment, but ranching and lumbering continue to be important.

Subsections. The Modoc Plateau Section is divided into 16 subsections.

Subsection M261Ga
Lower Klamath - Tule Lake Basins

This subsection is a lake plain that is occupied in part by the Lower Klamath and Tule Lakes. The climate is temperate and semi-arid to subhumid. MLRA 21f.

Lithology and Stratigraphy. Quaternary lacustrine deposits dominate this subsection.

Geomorphology. The landform is a nearly level lake plain. The elevation range is about 4037 to 4100 feet. Fluvial erosion, lacustrine deposition, and freeze-thaw are the main geomorphic processes.

Soils. Soils are mostly Typic Haplaquands; Aquandic Haplaquolls; Typic, Fluvaquentic, Torripsammentic, and Pachic Haploxerolls; Limnic Borohemists; Xerollic Durorthids; and Aquic Haplodurids. The soils are well to very poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are aridic, xeric, and aquic.

Subsection M261Ga, Lower Klamath Lake area, M261Dh midground, Mt. Shasta in background — *James R. Nelson*

Vegetation. The predominant natural plant communities are Big sagebrush series, Mixed saltbush series, Sedge meadow communities, and Emergent aquatic communities.

Characteristic series by lifeform include:
Marshes: Bulrush series, Bulrush - cattail series, Cattail series.

Grasslands: Alkali sacaton series, Ashy ryegrass series, Common reedgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Needle-and-thread series, Pickleweed series, Saltgrass series.

Shrublands: Big sagebrush series, Bitterbush series, Greasewood series, Iodine bush series, Mixed saltbush series, Parry rabbitbrush series, Rubber rabbitbrush series, Shadscale series.

Climate. The mean annual precipitation is about 10 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 46° to 50° F. The mean freeze-free period is in the range from 100 to 125 days.

Surface Water. Runoff is very slow. Drainage is facilitated by artificial canals. Any water that drains from the lake plain flows to the Klamath River.

Subsection M261Gb
Devil's Garden

This subsection is a volcanic plateau between Tule Lake and Goose Lake, excluding higher land on Crowder Flat (subsection M261Gc). The climate is temperate and semi-arid to subhumid. MLRA 21e.

Lithology and Stratigraphy. The bedrock is predominantly Pleistocene basalt and lesser amounts of Pliocene basalt and Tertiary andesite and pyroclastic rocks. Most of the Tertiary volcanic rocks are west of Clear Lake Reservoir. There are some alluvial and lacustrine deposits in

Subsection M261Gb, north of Big Sage Reservoir — *Scott Miles*

small depressions. Most of the faults are aligned north-south; some curve around toward the northwest.

Geomorphology. The main landform is a gently to moderately sloping plateau with few moderately steep to steep hills and scarps. There are a few late Quaternary cinder cones on the west side of the subsection. The plateau lacks a well integrated drainage system. There are few stream channels and many small closed depressions, although much of the subsection drains to streams in the Pit or Klamath River systems. Basin-fill on basin floors in small depressions is a small but important part of the subsection. The elevation range is from about 4100 feet adjacent to Tule Lake up to 5582 feet on Doublehead Mountain. Faulting, fluvial erosion and deposition and freeze-thaw are the main geomorphic processes.

Soils. Soils on uplands are mostly Typic, Lithic, Aridic, Pachic, and Pachic Ultic Argixerolls; Xerollic, Abruptic Xerollic, and shallow Xerollic Durargids; Lithic Xerollic Torriorthents; Xerollic Camborthids; Pachic Haploxerolls; and Argiduridic and Palexerollic Durixerolls. Soils on basin floors are most commonly Typic Chromoxererts and Xeric Endoaquerts. The soils are well drained on upland and well to poorly drained on basin floors. Soil temperature regimes are mostly mesic. Soil moisture regimes are mostly aridic and xeric, but some are aquic on basin floors.

Vegetation. The predominant natural plant communities are Big sagebrush series and Western juniper series. Low sagebrush series is common on shallow soils, and Curlleaf mountain mahogany is common on very stony soils. Silver sagebrush and Sedge meadow communities occur on floodplains and basin floors.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, Bluebunch wheatgrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series, Shorthair sedge series.

Shrublands: Big sagebrush series, Bitterbrush series, Parry rabbitbrush series, Rubber rabbitbrush series.

Forests and woodlands: Aspen series, Curlleaf mountain-mahogany series, Knobcone pine series, Western juniper series.

Climate. The mean annual precipitation is about 10 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 45° to 50° F. The mean freeze-free period is in the range from 75 to 125 days.

Surface Water. Runoff from uplands is rapid. Water drains down through joints in the basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. Much of the surface drainage is internal, to closed depressions in the subsection, and water ponds in many small depressions. There are few stream and most of those are dry during summer. The largest of several reservoirs is Clear Lake. Streams that flow from the subsection drain to Goose Lake, the Lower Klamath Lake basin, the Pit River, or tributaries of the Pit River.

Subsection M261Gc Crowder Flat

This subsection consists of the higher part of a volcanic plateau west of Goose Lake. The climate is temperate to cold, and subhumid. MLRA 21e.

Lithology and Stratigraphy. The bedrock is predominantly Miocene basalt and lesser amounts of Pleistocene basalt and Tertiary pyroclastic rocks. There are some alluvial and lacustrine deposits in small depressions. Most of the faults are aligned north-south or toward the northwest.

Geomorphology. The main landform is a gently to moderately sloping plateau with few low moderately steep to steep scarps. The plateau has a moderately well integrated drainage system, with few small closed depressions. The elevation range is from about 4800 feet adjacent to Goose Lake up to 6062 feet on Muldoon Mountain. Fluvial erosion and freeze-thaw are the main geomorphic processes.

Soils. The soils are mostly Typic, Lithic, Lithic Ultic, Pachic, Pachic Ultic, and Ultic Argixerolls. The soils are well drained. Soil temperature regimes are mostly frigid. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Ponderosa pine series and White fir series. Curlleaf mountain mahogany series is common on very stony soils. Low sagebrush series occurs on shallow soils.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, Bluebunch wheatgrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.
Shrublands: Big sagebrush series, Bitterbrush series, Parry rabbitbrush series, Rubber rabbitbrush series.
Forests and woodlands: Curlleaf mountain-mahogany series, Ponderosa pine series, White fir series.

Climate. The mean annual precipitation is about 20 to 30 inches. Much of the precipitation is snow. Mean annual temperature is about 42° to 48° F. The mean freeze-free period is in the range from 50 to 100 days.

Surface Water. Runoff from uplands is rapid; much of it drains down through joints in the basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. There are few streams and most of those are dry during at least part of summer. Streams that flow from the subsection drain to Goose Lake or across Devil's Garden to the Lower Klamath Lake basin or the Pit River.

Subsection M261Gd
Mowitz Buttes

This subsection is a volcanic plateau, between the Big Valley Mountains (subsection M261Gn) and Devil's Garden (subsection M261Gb). The climate is temperate and subhumid. MLRA

Lithology and Stratigraphy. The bedrock is predominantly Pleistocene, and possibly some late Tertiary, basalt and lesser amounts of pyroclastic rocks. There are some alluvial and lacustrine deposits in small depressions and around Egg Lake.

Geomorphology. The main landform is a gently to moderately sloping plateau with few moderately steep hills that might be eroded shield domes. The plateau has a moderately well integrated drainage system, with few small closed depressions. Basin-fill on basin floors in the small depressions is a small but important part of the subsection. The elevation range is from about 4300 feet in low basins up to 5415 feet on a butte. Fluvial erosion and deposition, lacustrine deposition, and freeze-thaw are the main geomorphic processes.

Soils. Soils on uplands are mostly Typic, Lithic, and Pachic Ultic Argixerolls and lesser amounts of Alfic Vitrixerands, Andic Haploxeralfs, Vitrandic Palexeralfs, shallow Argiduridic Durixerolls, and shallow Typic Durixeralfs. Soils in alluvial and lacustrine deposits on basin floors are most commonly Aquic Haploxerolls, Chromic Haploxererts and Xeric Endoaquerts. The soils are well drained on upland and well to poorly drained on basin floors. Soil temperature regimes are mostly mesic. Soil moisture regimes are mostly xeric, but some are aquic on basin floors.

Vegetation. Natural plant communities are predominantly Ponderosa pine series and some Western juniper series and Big sagebrush series. Low sagebrush series is common on shallow soils. Sedge meadow communities occur in basins.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, Bluebunch wheatgrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.
Shrublands: Big sagebrush series, Curlleaf mountain-mahogany series, Bitterbrush series, Parry rabbitbrush series, Rubber rabbitbrush series.
Forests and woodlands: Aspen series, Knobcone pine series, Oregon white oak series, Ponderosa pine series, Western juniper series, White fir series.

Climate. The mean annual precipitation is about 15 to 25 inches. Much of the precipitation is snow. Mean annual temperature is about 45° to 50° F. The mean freeze-free period is in the range from 75 to 100 days.

Surface Water. Runoff from uplands is rapid; much of it drains down through joints in the basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. Some of the drainage is internal, to closed depressions in and around the subsection, and water ponds in many small depressions. There are few stream and most of those are dry during summer. Streams that flow from the subsection drain to the Pit River or its tributaries.

Subsection M261Ge
Goose Lake Basin

This subsection consists of an alluvial-lacustrine plain around Goose Lake. The climate is temperate and semiarid to subhumid. MLRA 21e.

Lithology and Stratigraphy. Quaternary alluvial and lacustrine deposits dominate this subsection. There are a few small areas of Pleistocene basalt.

Geomorphology. The landforms are gently sloping to nearly level alluvial fans and basin floor, or lake plain. The elevation range is about 4700 to 5000 feet. Fluvial and lacustrine erosion and deposition and freeze-thaw are the main geomorphic processes.

Soils. Soils on basin floor or lake plain are mostly Cumulic Haploxerolls, Typic and Aquandic Argialbolls, Typic Natrixeralfs, and Xeric Endoaquerts. Those on alluvial fans are mostly Xerollic and shallow Xerollic Durargids and Argiduridic and Palexerollic Durixerolls. Those on basalt are mostly Lithic Argixerolls and Abruptic Xerollic Durargids. The soils are well to poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are aridic, xeric, and aquic.

Vegetation. The natural plant communities include Big sagebrush series, Low sagebrush series, Mixed saltbush series, and Sedge meadow communities.

Characteristic series by lifeform include:
Marshes: Bulrush series, Bulrush - cattail series, Cattail series.

Grasslands: Alkali sacaton series, Ashy ryegrass series, Common reedgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Needle-and-thread series, Pickleweed series, Saltgrass series.

Shrublands: Big sagebrush series, Bitterbush series, Greasewood series, Iodine bush series, Mixed saltbush series, Parry rabbitbrush series, Rubber rabbitbrush series, Shadscale series.

Climate. The mean annual precipitation is about 15 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 46° to 48° F. The mean freeze-free period is in the range from 100 to 125 days.

Surface Water. Runoff is very slow. It drains to Goose Lake, which has no outlet now but drained to the Pit River when the lake level was higher.

Subsection M261Gf Warner Mountains

This subsection comprises the Warner Mountains. The climate is cold to very cold and subhumid. MLRAs 21e and 22e.

Subsection M261Gf, west of Warner Peak —*James R. Nelson*

Lithology and Stratigraphy. The bedrock is predominantly Miocene basalt and Tertiary pyroclastic rocks. Shallow (hypabyssal) Tertiary intrusive rocks are common in the northern part of the Warner Mountains. The Warner Mountains are tilted westward, a process that is continuing by uplift on the Surprise Valley Fault, relative to Surprise Valley, which is along the eastern edge of the subsection. There are many small valleys, but only Fandango Valley has more than a few hundred acres of alluvial fill. There are a few small areas of glacial till.

Geomorphology. The Warner Mountains are a north-south aligned mountain block that is very steep on the east side and moderately steep to steep on the west side. They have been modified by glacial and fluvial erosion. The elevation range is from about 5000 feet up to 9892 feet on Eagle Peak. Fluvial erosion and freeze-thaw are the main geomorphic processes, plus mass wasting on the east side of the mountains.

Soils. Soils are mostly Typic, Lithic, Pachic, and Argic Cryoborolls; Dystric Xerorthents; Andic Xerumbrepts; Typic, Lithic Ultic, Pachic, and Pachic Ultic Argixerolls. The soils are well drained. Soil temperature regimes are frigid and cryic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Ponderosa pine series, Jeffrey pine series, Mixed conifer series, and White fir series. Lodgepole pine series, Aspen series, and Sedge meadow communities are common, and Whitebark pine series occurs at higher elevations. Montane meadow, Montane wetland shrub, Subalpine meadow, and Subalpine wetland shrub habitats are present.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, Bluebunch wheatgrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series, Rocky Mountain sedge series, Shorthair sedge series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Bitterbrush series, Black sagebrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series, Tobacco brush series.

Forests and woodlands: Aspen series, Curlleaf mountain-mahogany series, Ponderosa pine series, Lodgepole pine series, Washoe pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 20 to 30 inches. Much of the precipitation is snow. Mean annual temperature is about 30° to 45° F. The mean freeze-free period is in the range from 25 to 100 days.

Surface Water. Runoff from uplands is rapid. Many of the streams are perennial; some are dry during at least part of summer. Streams on the west drain to Goose Lake or the Pit River, and those on the east side of the mountains, which are much shorter, drain to Surprise Valley.

Subsection M261Gg Pit River Valley

This subsection consists of a low area along the Pit River. The climate is temperate and semi-arid to subhumid. MLRA 21e.

Lithology and Stratigraphy. Pliocene nonmarine sedimentary deposits, Pleistocene basalt, and Quaternary alluvial and lacustrine deposits are the main components in this subsection.

Geomorphology. The landforms are gently sloping to moderately steep plains and hills on slightly to moderately eroded and dissected lava flows and nonmarine sedimentary deposits, and nearly level floodplains and basin floors. There are both lacustrine and alluvial deposits on the basin floors. The elevation range is about 4300 to 5800 feet. Faulting, fluvial erosion and deposition and freeze-thaw are the main geomorphic processes.

Soils. Soils on basalt are mostly Lithic, Typic, and Pachic Argixerolls; Leptic Haploxererts; Xerertic Haplargids; and shallow Argiduridic Durixerolls. Those on Pliocene sedimentary deposits are mostly Typic, Aridic, and Pachic Argixerolls; shallow Argiduridic Durixerolls; Xerollic and Palexerollic Durargids; and Entic Chromoxererts. Soils on flood plains and basin floor are mostly Aquic Xerofluvents; Aquandic Humaquepts; Xeric Endoaquerts; Andaqueptic Haplaquolls; and Typic Argiaquolls. The soils are well to poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are aridic, xeric, and aquic.

Vegetation. The predominant natural plant communities are Big sagebrush series and Sedge meadow communities.

> **Characteristic series by lifeform include:**
> *Grasslands*: Ashy ryegrass series, Bluebunch wheatgrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.
>
> *Shrublands*: Big sagebrush series, Bitterbrush series, Parry rabbitbrush series, Rubber rabbitbrush series.

Climate. The mean annual precipitation is about 8 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 46° to 50° F. The mean freeze-free period is in the range from 100 to 125 days.

Surface Water. Runoff is rapid from upland and slow on basin floor. The Pit River is a tributary of the Sacramento River.

Subsection M261Gh Likely Tableland

This subsection is a very gently sloping footslope of the Warner Mountains. The climate is temperate and semi-arid to subhumid. MLRA 21e.

Lithology and Stratigraphy. The bedrock is predominantly Pliocene basalt. Tertiary pyroclastic rock is exposed in some ravines.

Geomorphology. The landform is an eroded and slightly dissected, very gently sloping lava flow. The surface form resembles a pediment, which may be a reflection of the landform that the flow was deposited on. The elevation range is about 4500 to 5500 feet. Faulting, fluvial erosion, and freeze-thaw are the main geomorphic processes.

Soils. Soils on uplands are mostly Lithic Argixerolls, Leptic Haploxererts, Xerertic Haplargids, and Argiduridic Durixerolls. The soils are well drained. Soil temperature regimes are mesic. Soil moisture regimes are aridic and xeric.

Vegetation. The predominant natural plant communities are Big sagebrush series, Bluebunch wheatgrass series, and Idaho fescue series. Low sagebrush series is common on shallow soils.

> **Characteristic series by lifeform include:**
> *Grasslands*: Ashy ryegrass series, Bluebunch wheatgrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.
>
> *Shrublands*: Big sagebrush series, Bitterbrush series, Black sagebrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series.
>
> *Forests and woodlands*: Curlleaf mountain-mahogany series.

Climate. The mean annual precipitation is about 12 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 45° to 48° F. The mean freeze-free period is in the range from 75 to 100 days.

Surface Water. Runoff is rapid. Streams that flow from the Warner Mountains through the subsection to the Pit River are perennial, but those that head within the subsection are dry during summer.

Subsection M261Gi Likely Mountain

This subsection is a faulted and eroded volcanic plateau with many volcanic hills and mountains. It is between the Warner Mountains and the Madeline Plains. The climate is temperate to cold and semi-arid to subhumid. MLRA21e.

Lithology and Stratigraphy. The bedrock is predominantly Miocene basalt and lesser amounts of Pleistocene basalt and Tertiary pyroclastic rocks. There are some alluvial and lacustrine deposits in small valleys. Most faults are aligned north-south east of the northwest-trending Likely Fault and toward the northwest west of the fault.

Geomorphology. The main landforms are a gently to moderately sloping volcanic plateau and moderately steep to steep shield volcanoes. The plateau has a moderately well integrated drainage system, with few small closed depressions. Basin-fill on basin floors in the small depressions is a small but important part of the subsection. A lake plain occurs in Jess Valley. The elevation range is from about 4500 feet up to 7376 feet on Likely Mountain and about 8000 feet on Red Rock Mountain at the southern edge of the Warner Mountains. Faulting, fluvial erosion and deposition, lacustrine deposition, and freeze-thaw are the main geomorphic processes.

Soils. Soils are mostly Dystric Xerorthents; Aridic and Pachic Haploxerolls; Typic, Lithic, Aridic, and Pachic Ultic Argixerolls; Xerollic, Xeralfic, and Xerertic Haplargids; Argiduridic and shallow Argiduridic Durixerolls; and Entic Chromoxererts. Also, there are Cumulic and Fluvaquentic Haploxerolls; Chromic Haploxererts; and Fluvaquentic Endoaquolls in alluvial and lacustrine deposits on basin floors. The soils are well drained on upland and well to poorly drained on basin floors. Soil temperature regimes are mostly mesic and frigid. Soil moisture regimes are mostly xeric and aridic, but some are aquic on basin floors.

Vegetation. The predominant natural plant communities are Western juniper series, Big sagebrush series, Jeffrey pine series, Ponderosa pine series, Mixed conifer series, and White fir series. Sedge meadow communities occur in basins.

> **Characteristic series by lifeform include:**
> *Grasslands*: Ashy ryegrass series, Bluebunch wheatgrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.
>
> *Shrublands*: Big sagebrush series, Bitterbrush series, Parry rabbitbrush series, Rubber rabbitbrush series.
>
> *Forests and woodlands*: Aspen series, Curlleaf mountain-mahogany series, Jeffrey pine series, Jeffrey pine - Ponderosa pine series, Ponderosa pine series, Western juniper series, White fir series.

Climate. The mean annual precipitation is about 12 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 40° to 48° F. The mean freeze-free period is in the range from 50 to 100 days.

Surface Water. Runoff from uplands is rapid; much of it drains down through joints in the basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. Some of the drainage is internal, to closed depressions in and around the subsection, and water ponds in many small depressions. There are few stream and most of those are dry during summer. Streams that flow from the subsection drain to either the Pit River or the Madeline Plains.

Subsection M261Gj Bald Mountain - Dixie Valley

This subsection is a faulted and eroded volcanic plateau with many volcanic hills and mountains. It is south of Big Valley and the Big Valley Mountains. The climate is temperate to cold and semi-arid to subhumid. MLRA 21e.

Lithology and Stratigraphy. The bedrock is predominantly Pliocene basalt and lesser amounts of Pleistocene basalt and Tertiary pyroclastic rocks. There are some alluvial and lacustrine deposits in small valleys. The alignments of most of the faults ranges from north-south to northwest.

Geomorphology. The main landforms are a gently to moderately sloping volcanic plateau and moderately steep to steep shield volcanoes. The plateau has a moderately well integrated drainage system, with few small closed depressions. Basin-fill on basin floors in the small depressions is a small but important part of the subsection. There are a few Pliocene cinder cones. The elevation range is from about 3500 feet up to 6067 feet on Dixie Peak on Bald Mountain. Faulting, fluvial erosion and deposition, lacustrine deposition, and freeze-thaw are the main geomorphic processes.

Soils. Soils are mostly Andic Xerumbrepts; Typic, Lithic, Lithic Ultic, Ultic, and Pachic Ultic Argixerolls; Lithic and Ultic Haploxeralfs; and shallow Argiduridic and shallow Abruptic Argiduridic Durixerolls. Also, there are Aquic Haploxerolls, Typic Melanaquands, and Typic Haplaquands in alluvial and lacustrine deposits on

Subsection M261Gj, Dixie Valley area — *David Schultz* basin floors. The soils are well drained on upland and well to poorly drained on basin floors. Soil temperature regimes are mesic and frigid. Soil moisture regimes are mostly xeric, but some aridic in and around valleys and some are aquic on basin floors.

Vegetation. The predominant natural plant communities are Western juniper series, Big sagebrush series, and Jeffrey pine series, and Ponderosa pine series. Sedge meadow communities occur in many of the basins.

> **Characteristic series by lifeform include:**
> *Grasslands*: Ashy ryegrass series, Bluebunch wheatgrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.
>
> *Shrublands*: Big sagebrush series, Bitterbrush series, Parry rabbitbrush series, Rubber rabbitbrush series.
>
> *Forests and woodlands*: Aspen series, Birchleaf mountain-mahogany series, Curlleaf mountain-mahogany series, Jeffrey pine series, Western juniper series, White fir series.

Climate. MLRA 21e. Mean annual precipitation is about 15 to 25 inches. Much of the precipitation is snow. Mean annual temperature is about 42° to 52° F. The mean freeze-free period is in the range from 75 to 150 days.

Surface Water. Runoff from uplands is rapid; much of it drains down through joints in the basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. Some of the drainage is internal, to closed depressions in the subsection, and water ponds in many small depressions. There are few streams and most of those are dry during summer. Streams that flow from the subsection drain to the Pit River, which runs through the northwestern edge of the subsection.

Subsection M261Gk
Horsehead Mountain

This subsection consists of mountains west of the Adin Mountains. It includes Horsehead, Schaffer, and Knox Mountains. The climate is cold to very cold and subhumid. MLRA 22e.

Lithology and Stratigraphy. The bedrock is predominantly Miocene basalt and lesser amounts of Tertiary pyroclastic rocks. Most faults are aligned toward the west-northwest on Schaffer Mountain and toward the north-northwest in the rest of the subsection.

Geomorphology. The main landforms are two mountain blocks that are steep on one side and gently sloping to moderately steep on the other side. The Schaffer Mountain block is steep on the south-southwest side and the Horsehead Mountain block is steep on the west-southwest side. There is at least one steep, eroded shield volcano east of Horsehead Mountain. There are few cinder cones. The elevation range is from about 4500 feet up to 7036 feet on the Horsehead Mountain block. Faulting, fluvial erosion, and freeze-thaw are the main geomorphic processes.

Soils. Soils are mostly Pachic and Pachic Ultic Argixerolls; Andic Haploxeralfs; Xeric Haplocryands; and Dystric Xerorthents. The soils are well drained. Soil temperature regimes are frigid and cryic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Jeffrey pine series, Ponderosa pine series, Mixed conifer series, and White fir series.

> **Characteristic series by lifeform include:**
> *Grasslands*: California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.
>
> *Shrublands*: Big sagebrush series, Bitterbrush series, Parry rabbitbrush series, Rubber rabbitbrush series.
>
> *Forests and woodlands*: Aspen series, Curlleaf mountain-mahogany series, Jeffrey pine series, Jeffrey pine - Ponderosa pine series, Ponderosa pine series, White fir.

Climate. The mean annual precipitation is about 20 to 25 inches. Much of the precipitation is snow. Mean annual temperature is about 35° to 45° F. The mean freeze-free period is in the range from 50 to 100 days.

Surface Water. Runoff is rapid; much of it drains down through joints in the basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. There are few streams and most of those are dry during summer. Streams drain to the Pit River or its tributaries.

Subsection M261Gl
Adin Mountains and Valleys

This subsection consists of mountains east-northeast of Big Valley, including Round Valley and other small valleys in the mountains. The climate is temperate to cold and semi-arid to subhumid. MLRA 21e.

Lithology and Stratigraphy. The bedrock is predominantly Miocene basalt and other Tertiary basalt and pyroclastic rocks. There are some alluvial and lacustrine deposits in small valleys. Southeast of Round Valley most faults are aligned toward the northwest, and northwest of Round Valley most major faults are oriented toward the west-northwest.

Geomorphology. The main landforms are mostly steep mountains and a gently to moderately sloping volcanic

Subsection M261Gl, Pit River area near Canby bridge — *Robert Ettner*

plateau. The mountains are elongated parallel to the major faults. There are alluvial fans and basin-fill on valley floors. The elevation range is from about 4500 feet up to 6394 feet on Fox Mountain. Faulting, fluvial erosion and deposition, lacustrine deposition, and freeze-thaw are the main geomorphic processes.

Soils. Soils are mostly Typic, Lithic, Lithic Ultic, Pachic, Ultic, and Pachic Ultic Argixerolls; Pachic Haploxerolls; and shallow Abruptic Argiduridic Durixerolls. Also, there are Argiduridic and shallow Argiduridic Durixerolls; Typic Chromoxererts; and Xeric Endoaquerts on alluvial fans and basin floors. The soils are well drained on upland and well to poorly drained on basin floors. Soil temperature regimes are mesic and frigid. Soil moisture regimes are mostly xeric, but some are aridic in and around valleys and some are aquic on basin floors.

Vegetation. The predominant natural plant communities are Western juniper series, Big sagebrush series, Jeffrey pine series, and Ponderosa pine series. Low sagebrush series is common on shallow soils. Sedge meadow communities occur in many of the basins.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, Bluebunch wheatgrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.

Shrublands: Big sagebrush series, Bitterbrush series, Black sagebrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series.

Forests and woodlands: Foothill pine series, Curlleaf mountain-mahogany series, Jeffrey pine series, Jeffrey pine - Ponderosa pine series, Ponderosa pine series, Western juniper series, White fir series.

Climate. The mean annual precipitation is about 20 to 25 inches. Much of the precipitation is snow. Mean annual temperature is about 42° to 50° F. The mean freeze-free period is in the range from 75 to 125 days.

Surface Water. Runoff from uplands is rapid; much of it drains down through joints in the basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. There are few streams and most of those are dry during summer. Streams drain to the Pit River, which runs through the northern part of the subsection, or to tributaries of the Pit River.

Subsection M261Gm Eagle Lake - Observation Peak

This subsection is a faulted and eroded volcanic plateau with many volcanic hills and mountains and basins. It is between the west end of the Honey Lake Valley and the Madeline Plains. The climate is temperate to very cold and semi-arid to subhumid. MLRA

Lithology and Stratigraphy. The bedrock is predominantly Pliocene basalt and lesser amounts of Pleistocene basalt and Miocene rhyolite and pyroclastic rocks. There are some alluvial and lacustrine deposits in valleys. The alignment of most of the faults ranges from north-south to northwest.

Geomorphology. The main landforms are a gently to moderately sloping volcanic plateau and moderately steep to steep, eroded shield domes and stratovolcanoes. There are few cinder cones. The drainage system is poorly integrated; there are many closed basins. Basin-fill on basin floors in small depressions is a small but important part of the subsection; it is most extensive around Horse Lake and Eagle Lake and in Willow Creek and Said Valleys. The elevation range is from about 4200 feet adjacent to Honey Lake Valley up to 7943 feet on Fredonyer Mountain and 7964 feet on Observation Peak. Faulting, fluvial erosion and deposition, lacustrine deposition, and freeze-thaw are the main geomorphic processes.

Soils. Soils are mostly Pachic Haploxerolls; Typic, Lithic, Aridic, Vitrandic, and Ultic Argixerolls; Xerollic, Xeralfic, and Xerertic Haplargids; Entic Chromoxererts; and Argic Cryoborolls. Also, there are Cumulic, Fluvaquentic, and Torripsammentic Haploxerolls; Xerollic Camborthids; and Aridic Argixerolls in alluvial and lacustrine deposits on basin floors. The soils are well drained on upland and well to somewhat poorly drained on basin floors. Soil temperature regimes are mostly mesic in basins and frigid on hills and mountains, and some are cryic at higher elevations. Soil moisture regimes are mostly xeric, but some are aridic at lower elevations.

Vegetation. The predominant natural plant communities are Western juniper series, Big sagebrush series, and Jeffrey pine series. Low sagebrush series and Black sagebrush series are common on shallow soils. Silver sagebrush series, Sedge meadow communities, and Emergent aquatic communities occur in many of the basins.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.

Shrublands: Big sagebrush series, Bitterbrush series, Black sagebrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series.

Forests and woodlands: Curlleaf mountain-mahogany series, Jeffrey pine series, Western juniper series.

Climate. The mean annual precipitation is about 15 to 30 inches. Much of the precipitation is snow. Mean annual temperature is about 38° to 50° F. The mean freeze-free period is in the range from 50 to 125 days.

Surface Water. Runoff from uplands is rapid; much of it drains down through joints in the basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. Some of the drainage is internal, to closed depressions in the subsection, and water ponds in many small depressions. Most of the ponds and lakes are ephemeral, but Eagle Lake is permanent. There are few streams and most of those are dry during summer. Streams that flow from the subsection drain to either the Honey Lake Valley or the Madeline Plains.

Subsection M261Gn
Big Valley Mountains

This subsection consists of mountains northeast of Fall River Valley and west of Big Valley. The climate is temperate to cold and subhumid. MLRA 22d.

Lithology and Stratigraphy. The bedrock is predominantly Tertiary basalt, with lesser amounts of Pleistocene basalt. Recent ash fall has influenced soil development. There are some alluvial deposits in small valleys. Most faults are aligned toward the northwest or the north-northwest.

Geomorphology. The main landforms are two mountain blocks that are steep on one side and gently sloping to moderately steep on the other side. The Big Valley Mountains block is steep on the southwest side and the Indian Spring Mountain block is steep on the west-southwest side. Jimmerson Mountain appears to be an eroded shield volcano. There are few cinder cones. There are alluvial fans and basin-fill on valley floors. The elevation range is from about 3700 feet up to 6321 feet on Widow Mountain. Faulting, fluvial erosion, and freeze-thaw are the main geomorphic processes.

Soils. Soils are mostly Lithic, Lithic Ultic, and Ultic Argixerolls; Lithic, Andic, and Ultic Haploxeralfs; Typic Haploxerands; Alfic Vitrixerands; Vitrandic Palexeralfs; and Abruptic Argiduridic and shallow Argiduridic Durixerolls. The soils are well drained on upland. Soil temperature regimes are mesic and frigid. Soil moisture regimes are mostly xeric, but some are aridic in and around valleys.

Vegetation. The predominant natural plant communities are Ponderosa pine and Mixed conifer series in the northern and central parts and Western juniper series and Big sagebrush series in the southern part of the subsection. White fir series is present at the higher elevations. Low sagebrush series occurs on shallow soils.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.

Shrublands: Big sagebrush series, Bitterbrush series, Black sagebrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series.

Forests and woodlands: Aspen series, Curlleaf mountain-mahogany series, Oregon white oak series, Western juniper series, Ponderosa pine series, White fir series.

Climate. Mean annual precipitation is about 20 to 30 inches. Much of the precipitation is snow. Mean annual temperature is about 42° to 50° F. The mean freeze-free period is in the range from 75 to 125 days.

Surface Water. Runoff from uplands is rapid; much of it drains down through joints in the basalt to the ground water reservoir, limiting overland flow of water and development of stream channels. There are few streams and many of those are dry during summer. Streams drain to the Pit River, which runs around the southern end of the subsection, to tributaries of the Pit River, or to small closed basins northeast of the subsection.

Subsection M261Go
Big Valley

This subsection consists of the Big Valley alluvial - lacustrine plain. It is between the Big Valley and the Adin Mountains. The climate is temperate and semi-arid to subhumid. MLRA 21e.

Lithology and Stratigraphy. The subsection consists mainly of nonmarine Pliocene and Pleistocene sedimentary basin deposits, Pleistocene basalt, and late Quaternary lacustrine and alluvial deposits.

Geomorphology. The landform is a plain that is nearly level on lake floor and floodplains and very gently to moderately sloping on older deposits. The elevation range is about 4100 to 4200 feet. Fluvial erosion and deposition and freeze-thaw are the main geomorphic processes.

Soils. Soils on basalt and sedimentary deposits are mostly Lithic and Ultic Argixerolls and shallow Argiduridic and shallow Abruptic Argiduridic Durixerolls. Those on lake floors and floodplains are mostly Aquic Haploxerolls, Typic Chromoxererts, Xeric Endoaquerts, and Typic Haplaquands. The soils are well to poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are aridic, xeric, and aquic.

Vegetation. The predominant natural plant communities are Low sagebrush series, Silver sagebrush series, and Sedge meadow communities.

Subsection M261Go, Big Valley area — *James R. Nelson*

Characteristic series by lifeform include:

Marshes: Bulrush series, Bulrush - cattail series, Cattail series.

Grasslands: Alkali sacaton series, Ashy ryegrass series, Common reedgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Needle-and-thread series, Pickleweed series, Saltgrass series.

Shrublands: Big sagebrush series, Bitterbrush series, Black sagebrush series, Greasewood series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series, Shadscale series.

Climate. The mean annual precipitation is about 15 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 48° to 50° F. The mean freeze-free period is in the range from 100 to 125 days.

Surface Water. Runoff is very slow. The Pit River runs through Big Valley, and Ash Creek from the Adin Mountains and Widow Creek from the Big Valley Mountains join the Pit River in Big Valley.

Subsection M261Gp Fall River Valley

This subsection is an alluvial - lacustrine plain in a northwest-trending valley that is southwest of the Big Valley Mountains. The alluvial - lacustrine plain is bound by a Pleistocene basalt flow on the southeast and a recent (Holocene) basalt flow on the northwest. It has a temperate and semi-arid to subhumid climate. MLRA 21e.

Lithology and Stratigraphy. The subsection consists mainly of nonmarine Pleistocene sedimentary basin deposits and late Quaternary lacustrine and alluvial deposits. There are a few small areas of Pleistocene basalt.

Geomorphology. The landform is a plain. It is nearly level on the lake floor and very gently to moderately sloping on Pleistocene sedimentary deposits. The elevation range is about 3200 to 3600 feet. Fluvial erosion and freeze-thaw are the main geomorphic processes.

Soils. Soils are mostly Typic and Ultic Argixerolls; Typic Vitrixerands; shallow Dystric Xerochrepts; shallow Typic Durixeralfs; Ultic Palexeralfs; and shallow Abruptic Argiduridic Durixerolls. The soils are well drained. Soil temperature regimes are mesic. Soil moisture regimes are mostly xeric, with some aridic and some aquic.

Vegetation. The predominant natural plant communities are Big sagebrush series, Low sagebrush series, Silver sagebrush series, Sedge meadow communities, and Emergent aquatic communities.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, California oatgrass series, Creeping ryegrass series, Idaho fescue series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.

Shrublands: Big sagebrush series, Bitterbrush series, Black sagebrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series.

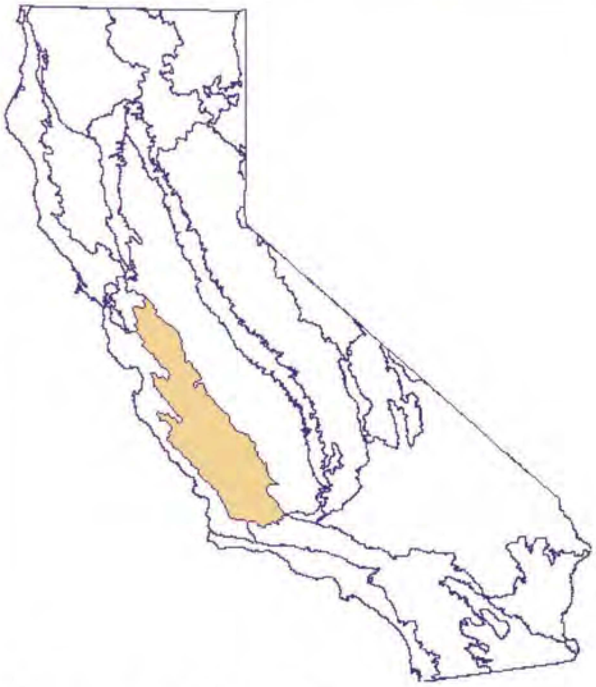
Forests and woodlands: Birchleaf mountain-mahogany series.

Climate. The mean annual precipitation is about 16 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 50° to 52° F. The mean freeze-free period is in the range from 125 to 150 days.

Surface Water. Runoff is very slow. The Pit River runs through Fall River Valley. Lakes along the northern edge of the alluvial - lacustrine plain, adjacent to a large recent (Holocene) basalt flow, are fed by very large springs.

Subsection M261Gp, Pit River area in Fall River valley — *Robert Ettner*

CHAPTER 12



Section M262A Central California Coast Ranges

This section is the interior part of the southern Coast Ranges of California, south of the Carquinez Strait. It is inland from the coast far enough that the climate is modified only slightly by marine influence. It is bounded on the northeast by the alluvial plain of the San Joaquin Valley and on the southwest by the coastal part of the southern Coast Ranges (Section 261A). It extends south to the Transverse Ranges. It is in MLRA 15 and includes small parts of MLRAs 14, 17, and 20.

Geomorphology. Parallel ranges, folded, faulted and metamorphosed strata; rounded crests of subequal height. Coast Ranges Geomorphic provinces.

Lithology. Cenozoic marine and nonmarine sedimentary rocks and alluvial deposits, Late Mesozoic shelf, slope and eugeosynclinal sedimentary rocks, and Mesozoic ultramafic rocks.

Soil Taxa. Alfisols, Aridisols, Entisols, Inceptisols, Mollisols and Vertisols in combination with thermic or mesic soil temperature regimes and xeric or aridic soil moisture regimes.

Vegetation. Predominant potential natural communities include the Coast Live oak series, Blue oak series, Purple needlegrass series, Chamise series, Valley oak series and mixed chaparral shrublands.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: California annual grassland series, Cheatgrass series, Giant reed series and Tamarisk series.
>
> *Series that can occur in all subsections, but are not extensive*: Beaked sedge series, Bulrush series, Bulrush - cattail series, Cattail series, Creeping ryegrass series, Duckweed series, Foothill needlegrass series, Introduced perennial grassland series, Mexican elderberry series, Mosquito fern series, Nodding needlegrass series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Purple needlegrass series. Quillwort series, Saltgrass series, Sedge series and Spikerush series.
>
> *Series restricted to riparian settings*: Arroyo willow series, Buttonbush series, California sycamore series, Fremont cottonwood series, Mixed willow series, Mulefat series, Narrowleaf willow series, Red willow series and White alder series.

Fauna. Mammals include mule deer, pronghorn, tule elk, coyote, bobcat, ground squirrel and kangaroo rat. Birds include hawks, eagles, owls, quail, mourning dove, mockingbird, scrub jay, gulls, herons, crows, finches and sparrows. The California condor is being reintroduced in the southern part of the section. Introduced species include the Andean condor and feral pigs.

Elevation. 100 to 5200 feet.

Precipitation. 6 to 40 inches.

Temperature. 45° to 65°F.

Growing Season. 120 to 275 days.

Section M262A, Diablo Range — *Robert Ettner*

Surface Water Characteristics. Few slow and moderately slow moving rivers and streams flowing northerly to Monterey Bay via the Salinas River. Few streams in alluvial or weak bedrock channels flow directly toward the Pacific Ocean. Many streams that flow eastward in alluvial or weak bedrock channels to the Great Valley section do not flow throughout the summer. Reservoirs for irrigation and flood control are common.

Disturbance Regimes.
Fire: Fires are low, moderate or high intensity ground or stand replacing fires.
Seismic Activity: Seismically active area with strong shaking and ground rupture.
Climate: Wide fluctuations in precipitation and temperature for periods of years result in significant or catastrophic changes in biological communities.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to grazing and agriculture.

Cultural Ecology. Humans have been utilizing the section for about 8,000 years, and have been an integral part of Coast Range ecology for about 2,000 years. World renown Chumash rock art is a unique reflection of prehistoric lifestyle. Grazing is an important historic use, beginning with land grants during the Mexican period. Contemporary attitudes and beliefs are dichotomized between emphasis on amenity/newcomer and commodity/long-time resident values, but all overlain by a rural lifestyle. Economic emphases are recreation, agriculture, and government.

Subsections. The Central California Coast Ranges Section is divided into 11 subsections.

Subsection M262Aa Fremont - Livermore Hills and Valleys

This subsection consists of the Livermore - San Ramon Valley and hills around it, between the Greenville and the Calaveras faults, and hills southeast of Fremont that are between the Calaveras fault and the Santa Clara Valley. The climate is hot and subhumid. MLRAs 14d and 15d.

Lithology and Stratigraphy. This subsection contains mainly Miocene marine sediments along the Calaveras fault south of the Livermore - San Ramon Valley; Pliocene marine sediments in the north end of the Livermore - San Ramon Valley; Plio-Pleistocene nonmarine sediments in the south end of the Livermore Valley; and Quaternary alluvium in the Livermore - San Ramon Valley. Much of the subsection is bounded by Mesozoic rocks of the Franciscan Complex and the Great Valley Sequence, and some of those rocks are included in this subsection.

Geomorphology. This subsection includes a late Quaternary alluvial plain running east to west across the middle of the Livermore - San Ramon Valley; moderately steep hills with rounded summits north of the alluvial plain; moderately steep to steep hills with flat summits south of the alluvial plain; and moderately steep to steep hills along the Calaveras fault and between the fault and the Santa Clara Valley. The elevation range is from about 300 feet to 1200 feet in Livermore Valley and about 100 feet in the Santa Clara Valley to 2594 feet on Monument Peak northeast of the valley. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic Xerochrepts and Typic Argixerolls on Miocene marine sediments; Typic Chromoxererts and Chromic Pelloxererts on Pliocene marine sediments; and Mollic Haploxeralfs and Mollic Palexeralfs on Plio-Pleistocene nonmarine sediments. On the Quaternary alluvial plain across the center of the Livermore - San Ramon Valley, the soils are Haploxeralfs, Palexeralfs, and Haploxerolls on old fans and terraces; Xerorthents and Haploxerolls in recent alluvium on the south; and Typic and Chromic Pelloxererts and Aquic Natrixeralfs in recent alluvium on the north. The older soils are leached free of carbonates, but carbonates accumulate in the subsoils of many others. The soils are well drained, except for small areas of somewhat poorly drained soils on alluvial plains. Soil temperature regimes are thermic. Soil moisture regimes are almost exclusively xeric.

Vegetation. The predominant natural plant communities are Needlegrass grasslands in the hills around Livermore Valley and, in the hills northeast of the Santa Clara Valley. Blue oak series and Needlegrass grasslands occur on south-facing slopes and Coast live oak series on north-facing slopes. Valley oak series and California sycamore series are common plant communities on recent alluvial plains.

> **Characteristic series by lifeform include:**
> *Grasslands*: California annual grassland series, Purple needlegrass series.
>
> *Forests and woodlands*: Blue oak series, California buckeye series, California sycamore series, Coast live oak series, Valley oak series.

Climate. The mean annual precipitation is about 15 to 20 inches. Most of the precipitation is rain. Mean annual temperature is about 55° to 60° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Runoff to the alluvial plain is rapid and all but the larger streams are dry through most of the summer. Alluvial plain in the northern half of Livermore Valley drains slowly, and some of the soils are somewhat poorly drained. There are no natural lakes in the area, but a few reservoirs.

Subsection M262Ab
Western Diablo Range

This subsection is on mountains in the western part of the Diablo Range. They are south-southeast of the Livermore - San Ramon Valley. It is the more moist part of the Diablo Range. The climate is hot and subhumid. MLRAs 15d and 15e.

Lithology and Stratigraphy. This subsection is dominated by Franciscan sedimentary, minor volcanic, and metamorphic rocks. They are intensely folded and faulted. Also, there are some Cretaceous sedimentary rocks of the Great Valley Sequence. Ultramafic rocks are widely scattered through this subsection. There is a fairly large area of Miocene volcanic rocks, Quien Sabe volcanics, in the southern part of the subsection, east of Hollister.

Geomorphology. This is a subsection of mountains with rounded ridges, steep and moderately steep sides, and narrow canyons. Most of the mountains are aligned in north-northwest to northwest directions. The elevation range is from about 1000 feet adjacent to the Santa Clara Valley to about 4000 feet on the higher mountains (4209 feet on Mt. Hamilton). Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic Xerorthents, Haploxeralfs, and Argixerolls. On Miocene volcanics they are Pachic Ultic Haploxerolls, Typic Haploxeralfs, and Typic Argixerolls. Most of the soils are leached free of carbonates, but the subsoil is calcareous in some Xerolls. They are well drained. Few surfaces are old enough, because of active erosion, to have Palexeralfs. The soil temperature regimes are predominantly thermic, but mesic on north-facing slopes at higher elevation. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Blue oak series on south-facing and Coast live oak series on north-facing slopes. There is some Chamise series on shallow soils, and some Live oak chaparral shrublands on shallow soils at higher elevations and on north-facing slopes. Valley oak series and Needlegrass grasslands are common in valleys. Black oak series and Mixed conifer series are inextensive, but present on some north-facing slopes at higher elevations.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.

Shrublands: Bigberry manzanita series, California sagebrush series, Chamise series, Chamise - bigberry manzanita series, Scrub oak series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Birchleaf mountain-mahogany series, Blue oak series, California bay series, Canyon live oak series, Coast live oak series, Coulter pine series, Coulter pine - canyon live oak series, Ponderosa pine series, Valley oak series.

Climate. The mean annual precipitation is about 20 to 30 inches. Most of the precipitation is rainfall, with a little snow at higher elevations. Mean annual temperature is about 52° to 58° F. The mean freeze-free period is about 200 to 250 days.

Surface Water. Runoff is rapid and all but the larger streams are dry through most of the summer. Natural lakes are absent, but there are a few reservoirs in the area.

Subsection M262Ac
Diablo Range

This subsection consists of the steep mountainous central part of the Diablo Range and steep hills along the east-northeast side of the San Andreas fault between Hollister and Parkfield. It stretches from the edge of Livermore - San Ramon Valley south-southeast to Parkfield. It is bounded by the San Andreas fault on the southwest, by subsection 262Ab (Western Diablo Range) on the west, and by subsection M262Ad (Eastern Hills) on the east. The climate is hot and subhumid. MLRA 5e.

Lithology and Stratigraphy. This subsection is dominated by Franciscan sedimentary, minor volcanic, and metamorphic rocks. They are intensely folded and faulted. Also, there are some Cretaceous sedimentary

Subsection M262Ac, aerial view of Diablo Range — *Robert Ettner* rocks of the Great Valley Sequence. Ultramafic rocks are widely scattered through this subsection. The largest exposure of ultramafic rocks in the southern California Coast Ranges is the New Idria ultramafic body in this subsection. Some of the rocks in the hills along the north-northeast side of the San Andreas fault are those of the Franciscan Complex and Great Valley Sequence, but most are Cenozoic sediments including Paleocene marine, Miocene marine, Plio-Pleistocene nonmarine, and Quaternary stream terrace deposits.

Geomorphology. This subsection has two quite different parts. The larger part is mountains with rounded ridges, steep and moderately steep sides, and narrow canyons. Most of the mountains are elongated in north-northwest to northwest directions. The smaller part is steep hills and narrow valleys along and parallel to the San Andreas fault. The elevation range is from about 1000 feet adjacent to the Santa Clara Valley to about 4000 or 5000 feet on the higher mountains (5248 feet on San Benito Mountain). Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils of Franciscan and Great Valley Sequence terrain are mostly Lithic Xerorthents, Lithic Ruptic-Xerochreptic Haploxeralfs, and Typic and Ultic Argixerolls. Those of ultramafic terrain are mostly Lithic Argixerolls, and lesser amounts of Lithic Haploxerolls and Pachic Argixerolls. Soils of Franciscan terrain along the San Andreas fault zone are mostly Typic Chromoxererts and Chromic Pelloxererts. Those on Tertiary sediments are mostly Chromic Pelloxererts and Pachic and Calcic Pachic Haploxerolls. Most of the soils are leached free of carbonates, but the subsoil is calcareous in some Xerolls. They are well drained. Few surfaces are old enough, because of active erosion, to have Palexeralfs or Palexerolls. The soil temperature regimes are mostly thermic, but are mesic on north-facing slopes at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Blue oak series and, on shallow soils, Chamise series. There is Leather oak series on serpentine soils, and some Mixed chaparral shrublands. Sargent cypress series is present, but sparse, on serpentine soils. Also, there is some Black oak series and Mixed conifer series on north-facing slopes at higher elevations, and Jeffrey pine series on serpentine soils on San Benito Mountain.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Purple needlegrass series.

Shrublands: Bigberry manzanita series, California sagebrush series, Chamise series, Chamise - bigberry manzanita series, Deer brush series, Leather oak series, Rubber rabbitbrush series, Scrub oak series, Wedgeleaf ceanothus series.

Forests and woodlands: Black oak series, Birchleaf mountain-mahogany series, Blue oak series, California bay series, California buckeye series, California sycamore series, Canyon live oak series, Coast live oak series, Coulter pine series, Coulter pine - canyon live oak series, Foothill pine series, Incense-cedar series, Interior live oak series, Jeffrey pine series, Ponderosa pine series, Sargent cypress series, Stands on San Benito Mountain, Valley oak series.

Climate. The mean annual precipitation is about 15 to 25 inches. Most of the precipitation is rainfall, with a little snow at higher elevations. Mean annual temperature is about 45° to 58° F. The mean freeze-free period is about 200 to 250 days.

Surface Water. Runoff is rapid and all but the larger streams are dry through most of the summer. Natural lakes are absent, but there are a few reservoirs in the area.

Subsection M262Ad Eastern Hills

This subsection consists of hills and low mountains in the drier eastern and southeastern parts of the Diablo Range, including some hills south of the Range. It

Subsection M262Ad, eastern portion of unit next to San Joaquin Valley — *Robert Ettner* stretches from east of the Livermore - San Ramon Valley south-southeast to the Cholame Valley. The climate is hot and subhumid to arid. MLRA 15e.

Lithology and Stratigraphy. This subsection is dominated by rocks of the Franciscan Complex and the Great Valley Sequence. They are intensely folded and faulted. There are substantial areas of Eocene, Miocene, and Pliocene marine, and Plio-Pleistocene nonmarine sediments, and Quaternary alluvium.

Geomorphology. This subsection contains mostly low, steep mountains and foothills on the east-northeast edge of the Diablo Range and Avenal Ridge at the south-southeast end of the Range. At the south end, it includes moderately steep hills, and old alluvial fans along the east-northeast side of the San Andreas fault. The elevation range is from about 100 feet to about 2000 or 3000 feet on the higher mountains. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils of Franciscan and Great Valley Sequence terrain are mostly Calcic Haploxerolls, Lithic Xerorthents, Entic and Typic Chromoxererts, and Chromic Pelloxererts. Those on Tertiary marine sediments are Lithic Xerorthents, Calcixerollic Xerochrepts, Calcic Haploxerolls, Typic Haploxeralfs, and Entic and Typic Chromoxererts. Those on Plio-Pleistocene nonmarine sediments are Typic Haploxeralfs, Calcic Pachic Argixerolls, and Mollic Palexeralfs. There are Fluventic Haploxerolls and Aquic Xerofluvents in recent alluvium of Cholame Valley and other valleys that are parallel to the San Andreas fault. Many of the soils are calcareous in their subsoils. They are well drained. Soil temperature regimes are thermic. Soil moisture regimes are mostly xeric, and some aridic in the southeast extreme of this subsection.

Vegetation. The predominant natural plant communities are Needlegrass grasslands. There is some Blue oak series on north-facing slopes in wetter areas and some Chamise series on shallow soils. Valley oak series is common in valleys along the San Andreas fault zone.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series, Saltgrass series.

Shrublands: Allscale series, Arrow weed series, Bladderpod - California ephedra - narrowleaf goldenbush series, California sagebrush series, Fourwing saltbrush series, Shadescale series, Spinescale series.

Forests and woodlands: Blue oak series, California juniper series, California sycamore series, Foothill pine series, Valley oak series.

Climate. The mean annual precipitation is about 12 to 20 inches. Most of the precipitation is rainfall. Mean annual temperature is about 50° to 60° F. The mean freeze-free period is from 225 days at higher elevations to 250 days at lower elevations.

Surface Water. Runoff is rapid and all but the larger streams are dry throughout the summer. Natural lakes are absent, but there are a few reservoirs in the area.

Subsection M262Ae Interior Santa Lucia Range

This subsection is a steep mountainous part of the Santa Lucia Range that is far enough from the Pacific Ocean that marine effects on climate are diminished considerably. It stretches from just southwest of the Salinas Valley, near Greenfield, southeast to the Sisquoc River, east of the Santa Maria Valley. Its southwest boundary is near the Nacimiento fault. The climate is hot and subhumid. MLRA 15e.

Lithology and Stratigraphy. This subsection is predominantly Cretaceous sedimentary rocks of the Great Valley Sequence and Miocene marine sediments. It is mostly on the Salinian block. Some rocks of the Franciscan Complex are present in the south part where the subsection crosses the Nacimiento fault. A large body of granitic rock is exposed just northeast of Santa Margarita. And there are Plio-Pleistocene nonmarine sediments, Quaternary stream terrace deposits, and recent alluvium in many places, particularly along the San Antonio River.

Geomorphology. This is a subsection of steep mountains with rounded ridges, steep and moderately steep sides, and narrow canyons. Most of the mountains are elongated in north-northwest to northwest directions. The elevation range is from about 500 feet up to 4918 feet on Timber Peak in the San Rafael Mountains. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils of Great Valley Sequence terrain are mostly Lithic Xerochrepts, Lithic Haploxerolls, and Mollic Haploxeralfs. Those on Miocene sediments are mostly Pachic Haploxerolls, Calcic Haploxerolls, Argixerolls, and Lithic Xerorthents. Soils on granitic rocks are shallow Typic Xerorthents, Typic Xerochrepts, and Ultic Haploxerolls. Xerorthents, Haploxerolls, Argixerolls, Palexerolls, and Palexeralfs are common on nonmarine Plio-Pleistocene sediments. Most of the soils are leached free of carbonates, but the subsoil is calcareous in some. They are well drained. Soil temperature regimes are predominantly thermic, but mesic on north-facing slopes at higher elevation. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant community is Blue oak series. There is some Coast live oak series on north-facing slopes and Mixed conifer series at higher elevations. Chamise series is common on shallow soils, and soils that are very rocky or low in fertility. Mixed chaparral shrublands also occur in the unit.

Characteristic series by lifeform include:
Grasslands: California annual grassland series.
Shrublands: Bigberry manzanita series, Black sage series, California buckwheat series, California sagebrush series, California sagebrush - purple sage series, Chamise series, Chamise - bigberry manzanita series, Chamise - Eastwood manzanita series, Chamise - scrub oak series, Chamise - wedgeleaf ceanothus series, Chaparral whitethorn series, Chaparral yucca - California buckwheat series, Deer brush series, Eastwood manzanita series, Mixed sage series, Mountain-mahogany series, Mountain-mahogany - scrub oak series, Purple sage series, Red shank series, Chamise - red shank series, Scrub oak series, Tucker's oak series, Wedgeleaf ceanothus series.
Forests and woodlands: Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Blue oak series, California sycamore series, Canyon live oak series, Coulter pine series, Coulter pine - canyon live oak series, Knobcone pine series, Foothill pine series, Incense-cedar series, Interior live oak series, Sargent cypress series, Tanoak series, Valley oak series.

Climate. The mean annual precipitation is about 20 to 40 inches. Most of the precipitation is rainfall, with some snow at higher elevations. Mean annual temperature is about 45° to 58° F. The mean freeze-free period is from 200 days at higher elevations to 250 days at lower elevations.

Surface Water. Runoff is rapid and all but the larger streams are dry through most of the summer. Natural lakes are absent, but there are a few reservoirs in the area.

Subsection M262Af
Gabilan Range

This subsection comprises the steep mountains between the San Andreas fault on the northeast and the Salinas Valley on the southwest. The climate is hot and subhumid.

Lithology and Stratigraphy. This subsection has a core of Salinian block Mesozoic granitic rock and older metamorphic rocks, mainly the Sur Series, that dominate the northwestern part of the subsection. This core of pre-Cenozoic rocks is covered by Pliocene marine, Miocene nonmarine, and upper Miocene marine sediments toward the southeast. Remnants of nonmarine Plio-Pleistocene sediments are scattered across the southeastern part of the subsection. Miocene rhyolite flow and pyroclastic rocks are exposed on a down-faulted block at the Pinnacles, near the center of the subsection.

Geomorphology. This is a subsection of steep to very steep mountains on the northwest that grade to steep to moderately steep hills on the southeast. The mountain range is much steeper on the northeast, adjacent to the San Andreas fault, than on the southwest. Therefore, the longer and larger streams drain southwest, and the have more alluvium in their valleys. Only a few streams run parallel to the San Andreas fault and the axis of the Gabilan Range. The elevation range is from about 200 feet up to about 3450 feet in the northwestern part of the range. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils of granitic terrain are shallow Typic Xerorthents, Pachic Haploxerolls, Pachic Argixerolls, and Typic Haploxeralfs. Those on Miocene and Pliocene marine sediments are predominantly Calcic Haploxerolls, Typic Xerorthents and Typic Argixerolls. Chromic Pelloxererts and Pachic and Calcic Pachic Haploxerolls are common on Miocene and Plio-Pleistocene nonmarine sediments. Rock outcrop and Lithic Xerorthents dominate the Miocene volcanic terrain. The soils are generally leached free of carbonates in areas with more precipitation and mesic soil temperature regimes, but subsoils are commonly calcareous in areas of less precipitation and thermic soil temperature regimes. The soil temperature regimes are predominantly thermic, but mesic on north-facing slopes at higher elevation. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant community is Blue oak series, with Coast live oak series on north-facing slopes in at least the northwestern part of the subsection. There is some Black oak series and Mixed conifer series on north-facing slopes at higher elevations. Chamise series is common on shallow soils. Needlgrass grasslands prevail on Vertisols.

Characteristic series by lifeform include:
Grasslands: California annual grassland series, Purple needlegrass series.
Shrublands: Bigberry manzanita series, California sagebrush series, Chamise series, Chamise - bigberry manzanita series, Deer brush series, Scrub oak series, Wedgeleaf ceanothus series.
Forests and woodlands: Black oak series, Birchleaf mountain-mahogany series, Blue oak series, California sycamore series, Coast live oak series, Coulter pine series, Coulter pine - canyon live oak series, Foothill pine series, Interior live oak series, Valley oak series.

Climate. The mean annual precipitation is about 12 to 25 inches. Most of it is rainfall, with a little snow at higher elevations. Mean annual temperature is about 50° to 58° F. The mean freeze-free period is about 200 to 250 days.

Surface Water. Runoff is rapid and all but the larger streams are dry through most of the summer. Natural lakes are absent.

Subsection M262Ag
Kettleman Hills and Valleys

This subsection contains the Kettleman Hills and the Kettleman Plain. The climate is hot and arid. MLRA 17g.

Lithology and Stratigraphy. This subsection is dominated by an anticline with a core of upper Miocene and Pliocene marine sediments. Individual sections of the anticline are domes with rings of Plio-Pleistocene nonmarine sediments around the margins. A synclinal basin between anticlines is filled with Quaternary alluvium.

Geomorphology. This subsection is dominated by a low, discontinuous, northwest trending ridge that is an anticline. The discontinuous form of the ridge is reflected in the name - that is, Kettleman Hills, rather than Kettleman Ridge. Pleistocene nonmarine sediments and recent alluvial fan deposits have created a flat apron around the Kettleman Hills and a flat floor in Pleasant Valley and on Kettleman Plain. The elevation range is from about 500 to 600 feet on the fans up to about 1200 feet on the hills. Fluvial erosion and deposition are the main geomorphic process.

Soils. The soils are mostly Typic and Lithic Torriorthents on upper Miocene and Pliocene marine sediments; Typic Camborthids, Typic Halargids, and Typic Natrargids on Plio-Pleistocene nonmarine sediments; calcareous Typic Torrifluvents and Typic Torriorthents on Pleistocene nonmarine sediments; and Typic Torriorthents and Typic Haplargids on recent alluvial fans. Calcium carbonate accumulates in the subsoils, and more soluble salts accumulate in some of the soils. The soils are well drained. Soil temperature regimes are thermic. Soil moisture regimes are aridic.

Subsection M262Ag, Kettleman Hills area looking eastward toward San Joaquin Valley — *Kerry Arroues*

Vegetation. The predominant natural plant community is the California annual grassland series.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Saltgrass series.

Shrublands: Allscale series, Arrow weed series, Bladderpod - California ephedra - narrowleaf goldenbush series, California sagebrush series, Fourwing saltbrush series, Shadescale series, Spinescale series.

Climate. The mean annual precipitation is about 6 to 12 inches. All of the precipitation is rain. Mean annual temperature is about 62° to 65° F. The mean freeze-free period is about 225 to 250 days.

Surface Water. Runoff is rapid and local streams are dry before summer. Streams originating in mountains west of the Kettleman Hills have water longer into the dry season, but even they dry up during the summer. There are no lakes in the area.

Subsection M262Ah
Paso Robles Hills and Valleys

This subsection is a dissected plain and low, moderately steep to steep hills around it. It is bounded by the Gabilan Range of the north, by the San Andreas fault and the Cholame Hills on the northeast, and by the Santa Lucia Range on the southwest. The climate is hot and subhumid. MLRA 17g.

Lithology and Stratigraphy. This subsection is dominated by Plio-Pleistocene nonmarine sediments. There are much smaller areas of Miocene and Pliocene marine sediments and some Quaternary alluvium.

Geomorphology. This subsection is dominated by a dissected plain of Plio-Pleistocene nonmarine sediments. It is surrounded by low, moderately steep to steep hills in Miocene and Pliocene marine sediments. There are narrow strips of recent alluvium and stream terraces along the Salinas River and its tributaries. The elevation range is from about 600 along the Salinas River up to about 1200 feet on the hills. Mass wasting and fluvial erosion and deposition are the dominant geomorphic processes.

Soils. The soils are mostly Calcic Haploxerolls, Typic Argixerolls, and Calcixerollic Xerochrepts. Typic Haploxerolls, Typic Xeropsamments, and Pachic Argixerolls predominate on hills above the Plio-Pleistocene plain. Soils on the stream terraces are Typic and Mollic Haploxeralfs and Typic Palexeralfs, and those on floodplains are Typic Xerofluvents and Cumulic Haploxerolls. Calcium carbonates accumulate in the subsoils. Soil temperature regimes are thermic, and soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Blue oak series and Needlegrass grasslands. There is some Chamise series on shallow soils and Valley oak series on deep soils.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Purple needlegrass series.

Shrublands: Bigberry manzanita series, California sagebrush series, Chamise series, Chamise - bigberry manzanita series, Deer brush series, Scrub oak series, Wedgeleaf ceanothus series.

Forests and woodlands: Birchleaf mountain-mahogany series, Blue oak series, California sycamore series, Coast live oak series, Coulter pine series, Coulter pine - canyon live oak series, Foothill pine series, Interior live oak series, Valley oak series.

Climate. The mean annual precipitation is about 12 to 18 inches. All of the precipitation is rain. Mean annual temperature is about 55° to 60° F. The mean freeze-free period is about 225 to 250 days.

Surface Water. Runoff is rapid and all but the larger streams are dry through most of the summer. Natural lakes are absent.

Subsection M262Ai Carrizo Plain

This subsection is the floor of a broad valley that is aligned toward the northwest. It is bounded on the northeast by the Temblor Range and on the southwest by the Caliente Range. The San Andreas fault runs along the northeast edge of the Valley. The climate is hot and subhumid to arid. MLRA 17f.

Subsection M262Ai, Carrizo Plain area, Temblor Range (M262Ak) in background —*James R. Nelson*

Lithology and Stratigraphy. This subsection is dominated by Quaternary alluvium. There are large areas of Plio-Pleistocene nonmarine sediments that are more concentrated in the north end of the valley and small areas of Oligocene, Miocene, and Pliocene marine and nonmarine sediments along the southwest margin of the subsection. Lake sediments have been deposited and are still accumulating in the center of the valley.

Geomorphology. This subsection consists of nearly level to very gently sloping alluvial plain with low hills on the margins. The alluvial plain is dominated by recent fans and basin-fill. The basin-fill includes lacustrine deposits. There is little dissection of the Plio-Pleistocene depositional surface, and even less on the recent alluvial fans. The elevation range is from slightly less than 2000 feet in the center of the valley up to about 2400 feet on the hills. Fluvial erosion and deposition are the main geomorphic processes. Some of the sedimentation is lacustrine on basin-fill.

Soils. The soils are mostly Mollic Haploxeralfs and Aridic Haploxerolls on alluvial fans and Typic Natrixeralfs and Xeric Torriorthents around playas near the center of the basin-fill. Xeric Torriorthents are dominant and Calcic Haploxerolls are common on Plio-Pleistocene nonmarine and older sediments. The soils are well drained, except those around playas near the center of the valley. Carbonates accumulate in the subsoils, and more soluble salts accumulate in soils near the center of the basin-fill. Soil temperature regimes are thermic. Soil moisture regimes are aridic and xeric.

Vegetation. The predominant natural plant communities are California annual grassland series, Needlegrass grasslands, Salt grass series, and Emergent aquatic communities.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, purple needlegrass series, Saltgrass series.

Shrublands: Allscale series, Arrow weed series, Bladderpod - California ephedra - narrowleaf goldenbush series, Fourwing saltbrush series, Shadescale series, Spinescale series.

Climate. The mean annual precipitation is about 10 to 16 inches, all of which is rain. Mean annual temperature is about 55° to 58° F. The mean freeze-free period is about 225 to 250 days.

Surface Water. Runoff from hills is rapid. Water from the hills collects on the basin floor to form ephemeral lakes and ponds. Although there is no surface drainage from the center of the basin, it is open on the northwest end and drainage from there and from the western edge of the plain is to the Salinas River.

Subsection M262Aj Caliente Range - Cuyama Valley

This subsection comprises the mountains of the Caliente Range and hills and an alluvial plain along the Cuyama River. It is between the Carrizo Plain and the Sierra Madre Mountains. The climate is hot and subhumid to arid. MLRAs 15f, 15g, 17f, and 17g.

Lithology and Stratigraphy. This subsection is dominated by clastic sedimentary rocks and weakly consolidated deposits. There are large proportions of upper Cretaceous sedimentary rocks, Miocene marine sediments, Pliocene and Pleistocene nonmarine sediments, and Quaternary alluvium.

Geomorphology. This subsection contains steep mountains with narrow canyons in the Caliente Range and low hills, alluvial fans, pediments, and terraces along the Cuyama River. The mountains are oriented from northwest to southeast, curving around toward the east-southeast at the southeastern end where the mountains of this subsection bend around on the southwest side of a curve in the San Andreas fault. The Cuyama River runs lengthwise through the subsection, along the southwest side of the Caliente Range. The alluvial plain of the Cuyama River is broad in the southeastern part of the subsection, where it is about 5 or 6 miles across, with a fault on the north-northeast side and Tertiary sediments and dissected Quaternary alluvial fans on the south-southwest side of the valley. The elevation range is from just under 2000 feet up to about 5000 feet. It is about 2000 to 2600 feet in Cuyama Valley. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. On upper Cretaceous sedimentary rocks, the soils are mostly rocky Lithic Xerorthents and Mollic Haploxeralfs. On Miocene marine sediments, associated with badlands, the soils are mostly shallow Typic Xerorthents, Pachic Haploxerolls, and Mollic Haploxeralfs. On Pliocene and Pleistocene nonmarine sediments, the soils are mostly shallow Xeric Torriorthents, Typic Xerorthents, and Typic Haploxeralfs. On Quaternary alluvial fans, the soils are mostly Xerorthents, Typic and Mollic Haploxeralfs, and Pachic Argixerolls. On recent alluvium, they are Typic Xerofluvents and Xerorthents and Typic Salorthids. The soils are well drained, but the Salorthids are exceptions. Calcium carbonates accumulate in the subsoils, and more soluble salts accumulate in some soils in Quaternary alluvium. Soil temperature regimes are mostly thermic, with some mesic on north-facing slopes at higher elevations. Soil moisture regimes are mostly xeric, but aridic in much of the Cuyama Valley.

Vegetation. The predominant natural plant communities are Blue oak series, Needlegrass grasslands, Chamise series on shallow soils, and California annual grassland series around Cuyama Valley. Around Cuyama Valley, Allscale series is present on salty soils and Iodine bush series on very salty soils. California juniper series is present on the south side of Cuyama Valley.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, purple needlegrass series, Saltgrass series.

Shrublands: Allscale series, Arrow weed series, Bladderpod - California ephedra - narrowleaf goldenbush series, Chamise series, Cupleaf ceanothus - fremontia - oak series, Fourwing saltbrush series, Iodine bush series, Shadescale series, Spinescale series.

Forests and woodlands: Blue oak series. California juniper series, Mesquite series.

Climate. The mean annual precipitation is from 6 to 10 inches in Cuyama Valley up to about 15 inches in the mountains. The precipitation is mostly rain, with a little snow at higher elevations. Mean annual temperature is about 50° to 60° F. The mean freeze-free period is about 175 to 225 days.

Surface Water. Runoff from the mountains and hills is rapid, but drainage is slow from some of the soils in the Cuyama Valley. The Cuyama River runs northwestward through this subsection then, after leaving the subsection, southwestward across the Coast Ranges toward the Pacific Ocean. All streams other than the Cuyama River and its larger tributaries are dry through the summer. There are no natural lakes in the subsection.

Subsection M262Aj, Caliente Range area — *James R. Nelson*

Subsection M262Ak
Temblor Range

This subsection comprises the mountain range between the San Joaquin Valley and the Carrizo Plains. The San Andreas fault is along the southwestern edge of the subsection. The climate is hot and subhumid to arid. MLRA15f.

Lithology and Stratigraphy. This subsection is dominated by lower Cretaceous marine sedimentary rocks, Eocene marine sediments, and mostly by Miocene marine sediments. Plio-Pleistocene nonmarine sediments are extensive in the northwest part of the subsection.

Geomorphology. This subsection is a long narrow range of steep mountains aligned northwest, but it includes moderately steep hills around the margin of the Temblor Range. There are few valleys, or segments of valleys, wide enough to have appreciable areas of alluvium. The elevation range is from about 1200 feet up to about 4000 feet. Mass wasting and fluvial erosion are the main geomorphic processes. Creep is important on moderately steep Vertisols.

Soils. The soils are mostly Lithic Xerorthents, Typic Xerorthents, and Entic Chromoxererts. On Miocene sediments, in addition to the Xerorthents, shallow Xeric Torriorthents and Pachic Haploxerolls are common. Carbonates accumulate in subsoils. Soil temperature regimes are thermic. Soil moisture regimes mostly xeric, but aridic on shallow soils at lower elevations.

Vegetation. The predominant natural plant communities are Blue oak series, California juniper series, Needlegrass grasslands, Chamise series, and California annual grassland series.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, purple needlegrass series, Saltgrass series.

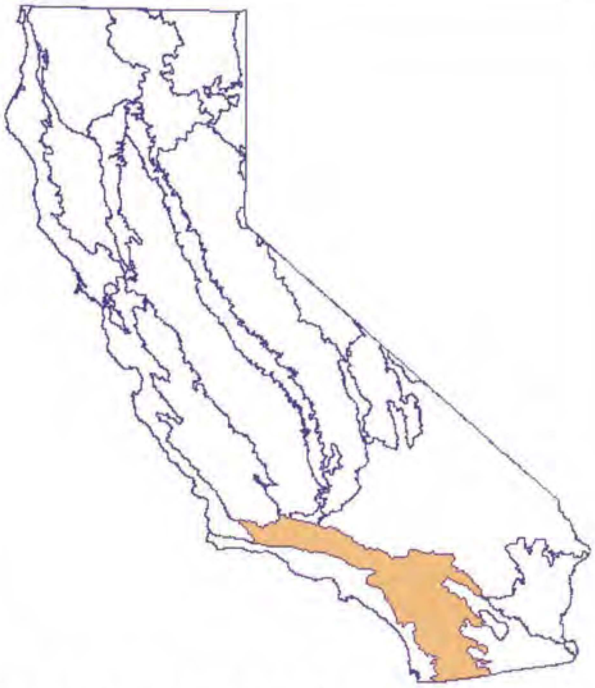
Shrublands: Allscale series, Arrow weed series, Bladderpod - California ephedra - narrowleaf goldenbush series, Chamise series, Cupleaf ceanothus - fremontia - oak series, Fourwing saltbrush series, Shadescale series, Spinescale series.

Forests and woodlands: Blue oak series. California juniper series.

Climate. The mean annual precipitation is from 9 to 15 inches. The precipitation is mostly rain. Mean annual temperature is about 55° to 65° F. The mean freeze-free period is about 200 to 275 days.

Surface Water. Runoff from the mountains and hills is rapid, and all of the streams are dry through the summer. There are no natural lakes in the subsection.

CHAPTER 13



Section M262B Southern California Mountains and Valleys

This section includes mountains, hills and valleys of the Transverse Ranges and the Peninsular Ranges that are near the Pacific Ocean, but not bordering it. Much of the section is close enough to the Pacific Ocean for the climate to be modified moderately marine influence. The section is mostly in MLRA 20 and partly in MLRA 19.

Geomorphology. Narrow ranges and broad fault blocks; alluviated lowlands, and dissected westward sloping granitic uplands. Transverse and Peninsular Ranges geomorphic provinces.

Lithology. Cenozoic marine and nonmarine sedimentary rocks and alluvial deposits, and Mesozoic granitic rocks.

Soil Taxa. Alfisols, Aridisols, Entisols, Inceptisols and Mollisols in combination with thermic, mesic or frigid soil temperature regimes and xeric or aridic soil moisture regimes.

Vegetation. Predominant potential natural communities includes Mixed chaparral shrublands, Chamise series, Canyon live oak series, Coast live oak series, Ponderosa pine series, Jeffrey pine series, White fir series and Lodgepole pine series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

Series dominated by exotic plants: Broom series, California annual grassland series, Cheatgrass series, Eucalyptus series, Giant reed series, Introduced perennial grassland series, Kentucky bluegrass series and Tamarisk series.

Series that can occur in all subsections, but are not extensive: Bulrush series, Bulrush - cattail series, Cattail series, Duckweed series, Mexican elderberry series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, One-sided bluegrass series, Saltgrass series, Sedge series and Spikerush series.

Series restricted to riparian settings: Arroyo willow series, California sycamore series, Fremont cottonwood series, Mixed willow series, Mulefat series, Narrowleaf willow series, Red willow series and White alder series.

Fauna. Mammals include mule deer, pronghorn, bighorn sheep, coyote, bobcat, mountain lion, ground squirrel and kangaroo rat. Birds include hawks, eagles, owls, quail, mourning dove, mockingbird, jays, gulls, herons, crows, finches and sparrows. Species of concern include cactus wren, California gnatcatcher, Bell's vireo, foothill and mountain yellow-legged frogs, orange-throated whiptail and California mountain kingsnake.

Elevation. 300 to 11,500 feet.

Precipitation. 6 to 40 inches.

Temperature. 40° to 70°F.

Section M262B, Crystal Lake Basin area — *Robert Ettner*

Growing Season. 150 to 300 days.

Surface Water Characteristics. Common rivers and streams, but most do not flow throughout the year. Rivers and streams flow in alluvial and weak bedrock channels westward to the Pacific Ocean, or eastward to basins in the Mojave Desert or Colorado Desert sections. Many reservoirs for municipal water supply and flood control occur below steep mountains throughout the section.

Disturbance Regimes.
Fire: Stand replacing fires of variable frequency, season and intensity.
Seismic Activity: Seismically active area with strong shaking and ground rupture.
Air Quality: Some plant and animal species show affects of air pollution.
Steep Slopes: Movement of coarse soil particles by gravity (dry ravel) is a common process in steep mountainous portions of the area.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to urbanization, grazing, agriculture and recreational activities. Valley portions are densely populated.

Cultural Ecology. Humans have been utilizing the area for some 10,000 years; the early San Dieguito Paleoindian hunting assemblage is well documented at sites along the San Dieguito River. After the end of the Pleistocene, prehistoric assemblages reflect extensive practice of seasonal rounds for resource gathering. Late in the 1700's the Spanish established colonies and missions, and converted the economy of the entire area to ranching and farming; the later citrus industry became a major agricultural influence. Contemporary attitudes and beliefs are varied; lifestyle is urban. The international border and large Hispanic populations contribute to cultural diversity. The economy is varied and urban oriented; tourism and recreation are important industries.

Subsections. The Southern California Mountains and Valleys section is divided into 16 subsections.

Subsection M262Ba
San Rafael - Topatopa Mountains

This subsection comprises the Coast Ranges northwest of the Big Pine fault, the Transverse Ranges south of the Santa Ynez fault, and an area between the Big Pine and Santa Ynez faults, west of the Pine Mountain fault, that is a transition between the Coast and the Transverse Ranges. The climate hot to temperate and subhumid; it is modified moderately by marine influence. MLRA 20e.

Subsection M262Ba, Sespe Creek and Pine mountain areas north of Ojai — *Robert Ettner*

Lithology and Stratigraphy. This subsection contains mainly Cretaceous, Eocene, Oligocene, Miocene, and Pliocene marine sedimentary rocks. Mesozoic rocks of the Franciscan Complex predominate southwest of the Camuesa fault, between it and the Little Pine fault.

Geomorphology. This is a subsection of steep mountains with narrow to rounded summits and narrow canyons. Mountains northwest of the Big Pine fault trend northwest, which is the common trend in the southern California Coast Ranges. Mountains south of the Santa Ynez fault trend east-west, which is the common trend in the Transverse Ranges. Mountains between the Big Pine and the Santa Ynez faults curve from a northwest trend on the north to an east-west trend on the south. The subsection elevation range is from about 1000 feet up to 7510 feet on Reyes Peak on Pine Mountain. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Typic and Lithic Xerorthents and Lithic Haploxerolls on rocks of the Franciscan formation; Typic and Lithic Xerochrepts, Lithic Haploxerolls, and Lithic, Mollic, and Ultic Haploxerolls on Cretaceous, Eocene, Oligocene, and some Miocene sedimentary rocks; and Calcixerollic Xerochrepts and Calcic Pachic Haploxerolls on Pliocene and some Miocene marine sedimentary rocks. Most, but not all, of the soils are leached free of carbonates. The soils are well drained. The soil temperature regimes are thermic at lower elevation and mesic at higher elevation. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities include Chamise series on shallow and very stony soils, Scrub oak series, and Mixed chaparral shrublands; some Coast live oak series, California sagebrush series, and Purple sage series at lower elevations; and small areas of Bigcone Douglas-fir series and Bigcone Douglas-fir -

canyon live oak series on north-facing slopes and in canyons. Mixed conifer series and Ponderosa pine series occur at higher elevations.

Characteristic series by lifeform include:
Grasslands: Beaked sedge series, Bur-reed series, California annual grassland series, Tufted hairgrass series.

Shrublands: Black sage series, California sagebrush series, California sagebrush - purple sage series, Bigberry manzanita series, California buckwheat series, California sagebrush - black sage series, Chamise series, Chamise - bigberry manzanita series, Chamise - black sage series, Chamise - Eastwood manzanita series, Chamise - wedgeleaf ceanothus series, Deebrush series, Eastwood manzanita series, Hairyleaf ceanothus series, Hoaryleaf ceanothus series, Hollyleaf cherry series, Interior live oak - canyon live oak series, Interior live oak - scrub oak shrub series, Mixed scrub oak series, Mountain-mahogany - hollyleaf cherry series, Scrub oak - birchleaf mountain-mahogany series, Parry rabbitbrush series, Purple sage series, Scrub oak series, Sumac series, Toyon - hollyleaf cherry series, Tucker's oak series, Wedgeleaf ceanothus series, White sage series.

Forests and woodlands: Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Black oak series, Black cottonwood series, Canyon live oak series, Coast live oak series, Coulter pine series, Coulter pine - canyon live oak series, Incense-cedar series, Interior live oak series, Jeffrey pine series, Mixed conifer series, Ponderosa pine series, White fir series.

Climate. The mean annual precipitation is about 20 to 40 inches. Most of it is rain at lower elevations, but much of it is snow at higher elevations . Mean annual temperature is about 40° to 60° F. The mean freeze-free period is about 175 to 250 days.

Surface Water. Runoff is rapid. All but the larger streams and those that drain from the higher watersheds are dry through the summer. Natural lakes are absent.

Subsection M262Bb Northern Transverse Ranges

This subsection is along the south-southwest side of the San Andreas fault, both northwest and southeast of the Big Pine fault. It is on the north-northeast edge of the Transverse Ranges from the Cuyama Valley on the west-northwest to the San Francisquito Fault on the east-southeast. The climate is mostly hot to temperate, but cold at higher elevations, and subhumid. Most of the subsection is high enough that the climate is influenced by elevation more than by the Pacific Ocean. MLRA 20e.

Subsection M262Bb, Cuyama River area north of Pine mountain — *Robert Ettner*

Lithology and Stratigraphy. This subsection contains large areas of Pre-Mesozoic gneisses, Mesozoic granitic rocks, Tertiary marine and nonmarine sedimentary rocks, and Quaternary sediments. The Tertiary marine sedimentary rocks are mostly Eocene and Oligocene, and some are Miocene and Pliocene.

Geomorphology. This is a subsection with steep mountains with narrow to rounded summits and narrow canyons, although there are a few broad valleys with Quaternary to Recent alluvial plains. The mountains trend east-west, except those southwest of the Cuyama River Valley which trend west-northwest. Hills along the San Andreas fault trend west-northwest. The subsection elevation range is from about 2000 feet up to 8831 feet on Mount Pinos. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Lithic and shallow Typic Xerorthents, Pachic and shallow Entic Haploxerolls, and Typic and Pachic Argixerolls on Pre-Mesozoic gneiss and Mesozoic granitic rocks; shallow Typic Xerorthents, Typic Xerochrepts, and Mollic Haploxeralfs on Tertiary sedimentary rocks; Typic Xerochrepts, Pachic Haploxerolls, and Mollic and Ultic Haploxeralfs on Pleistocene nonmarine sediments, and Xerofluvents on Recent alluvial fans and floodplains. Most of the soils are leached free of carbonates. The soils are well drained. Soil temperature regimes are mostly thermic and mesic, with some frigid at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are California juniper series in drier areas; Jeffrey pine series and Black oak series at higher elevations; and Chamise series on shallow and very stony soils, Scrub oak series, and Mixed chaparral shrublands. Mixed sage series is common at lower elevations in the southeast side of the subsection. Canyon live oak series is common on steep canyon sideslopes. Singleleaf pinyon series is common at higher elevations than the California juniper series. Birchleaf mountain-mahogany series is common in drier areas.

Characteristic series by lifeform include:
Grasslands: Beaked sedge series, Bur-reed series, California annual grassland series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Bigberry manzanita series, Bitterbrush series, Black bush series, Black sagebrush series, Bladderpod - California ephedra - narrowleaf goldenbush series, California buckwheat series, Canyon live oak shrub series, Chamise series, Chamise - bigberry manzanita series, Chamise - black sage series, Chamise - Eastwood manzanita series, Chamise - wedgeleaf ceanothus series, Deerbrush series, Eastwood manzanita series, Fourwing saltbush series, Greenleaf manzanita series, Hairyleaf ceanothus series, Holodiscus series, Hop-sage series, Interior live oak - canyon live oak shrub series, Mixed saltbush series, Mixed scrub oak series, Mountain whitethorn series, Mulefat series, Parry rabbitbrush series, Rubber rabbitbrush series, Scrub oak series, Shadscale series, Wedgeleaf ceanothus series, White sage series.

Forests and woodlands: Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Black cottonwood series, Black oak series, Blue oak series, California juniper series, Canyon live oak series, Curlleaf mountain-mahogany series, Coulter pine series, Coulter pine - canyon live oak series, Holly leaf cherry stands, Incense-cedar series, Jeffrey pine series, Limber pine series, Mixed conifer series, Ponderosa pine series, Singleleaf pinyon series, White fir series.

Climate. The mean annual precipitation is about 12 to 30 inches. Most of it is rain at lower elevations, but much of it is snow at higher elevations . Mean annual temperature is about 40° to 54° F. The mean freeze-free period is about 150 to 225 days.

Surface Water. Runoff is rapid. All but the larger streams and those that drain watersheds that are at higher elevation are dry through the summer. Natural lakes are absent.

Subsection M262Bc Sierra Pelona - Mint Canyon

This subsection includes the Sierra Pelona and a relatively low, but still mountainous, part of the north-northeastern Transverse Ranges between the Sierra Pelona and the San Gabriel Mountains. It is between the San Andreas fault on the east, the Santa Susana Mountains on the southwest, the Bee Canyon and Francisquito faults on the north, and Soledad Canyon on the south. The San Gabriel fault runs along the southwest border of the subsection. The climate is hot to temperate, and subhumid. MLRA 20e.

Lithology and Stratigraphy. This subsection has relatively large areas of Pre-Mesozoic plutonic rocks and gneisses, Mesozoic granitic rocks, Pre-Cretaceous Pelona schist, Oligocene volcanic rocks, Oligocene nonmarine and Miocene marine sedimentary rocks, Plio-Pleistocene sediments, and Quaternary alluvium.

Geomorphology. This is a subsection of steep mountains with narrow to rounded summits and narrow canyons, although there are a few broad valleys with Quaternary to Recent alluvial plains. The mountains trend east-west, but hills along the San Andreas fault trend west-northwest. The subsection elevation range is from about 1000 feet up to 5187 feet on Mount McDill in the Sierra Pelona. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Lithic and shallow Typic Xerorthents, shallow Entic Haploxerolls, and Mollic Haploxeralfs. Also, Lithic Haploxerolls are common on Pelona schist. Typic and Mollic Xerofluvents and Fluventic, Pachic, and Calcic Pachic Haploxerolls are common on Recent alluvial fans and floodplains. Most of the soils are leached free of carbonates. The soils are well drained. Soil temperature regimes are mostly thermic, with some mesic on north-facing slopes at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Chamise series on shallow and very stony soils, Mixed chaparral shrublands, and Coast live oak series. Purple sage series and Mixed sage series occur at lower elevations, Birchleaf mountain-mahogany - California buckwheat series occurs on south facing slopes, and Bigcone Douglas-fir series and Bigcone Douglas-fir - canyon live oak series occur on north-facing slopes at higher elevations. California juniper series is common on the interior side of the mountains.

Characteristic series by lifeform include:
Grasslands: Beaked sedge series, California annual grassland series, Tufted hairgrass series.

Shrublands: Allscale series, Big sagebrush series, Birchleaf mountain-mahogany - California buckwheat series, Bitterbrush series, Black bush series, Bladderpod - California ephedra - narrowleaf goldenbush series, California buckwheat series, California sagebrush series, California sagebrush - black sage series, Chamise series, Chamise - bigberry manzanita series, Chamise - Eastwood manzanita series, Chamise - wedgeleaf ceanothus series, Chamise - white sage series, Chamise - black sage series, Cupleaf ceanothus - fremontia - oak series, Fourwing saltbush series, Hop-sage series, Mixed saltbush series, Mixed scrub oak series, Mountain whitethorn series, Mulefat series, Nolina series, Purple sage series, Scalebroom series, Scrub oak series, Shadscale series, White sage series.

Forests and woodlands: Black oak series, Birchleaf mountain-mahogany series, California juniper series, Canyon live oak series, Coast live oak series, Curlleaf mountain-mahogany series, Coulter pine series, Coulter pine - canyon live series, Singleleaf pinyon series.

Climate. The mean annual precipitation is about 12 to 20 inches. Most of it is rain, except at higher elevations. Mean annual temperature is about 45° to 60° F. The mean freeze-free period is about 200 to 250 days.

Surface Water. Runoff is rapid. All but the larger streams are dry through the summer. Most of the streams drain through the Santa Clara river to the ocean, but those near the San Andreas fault drain into closed drainage basins. Natural lakes are absent, except along the San Andreas fault. There are numerous sag ponds along the San Andreas fault.

Subsection M262Bd
San Gabriel Mountains

This subsection comprises the lower and warmer parts of the San Gabriel Mountains, which are between the San Andreas fault on the north-northeast and the Los Angeles and Fontana Plains on the south. It is bounded by the Soledad River valley on the northwest and the San Fernando Valley on the southwest and extend eastward to the Cajon Pass. The climate is hot to temperate, and subhumid. MLRA 20e.

Lithology and Stratigraphy. This subsection contains mostly Mesozoic granitic rocks and Pre-Cambrian anorthosite. Also, there is some Pre-Cretaceous Pelona schist.

Subsection M262Bd, North Fork Lytle Creek area near Cajon Pass — *Robert Ettner*

Geomorphology. This is a subsection of steep and very steep mountains with narrow to rounded summits and narrow canyons. The mountains trend east-west, but hills along the San Andreas fault trend west-northwest. The subsection elevation range is from about 500 feet up to 6000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic and shallow Typic Xerorthents, shallow Entic Haploxerolls, and Calcic Haploxerolls. Most of the soils, but not all, are leached free of carbonates. The soils are well drained. Soil temperature regimes are mostly thermic, and some mesic on north-facing slopes at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Chamise series and Chamise - hoaryleaf ceanothus series, which are generally on shallow and very stony soils. Live oak chaparral series and Mixed chaparral shrublands also occur. Ponderosa pine series with some Bigcone Douglas-fir series and Bigcone Douglas-fir - canyon live oak series occurs on north-facing slopes, Jeffrey pine series occurs on the north-northeast side of the mountains, and California juniper series occurs on hills along the San Andreas fault.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, Bur-reed series, California annual grassland series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Bitterbrush series, Black bush series, Black sagebrush series, California buckwheat series, California buckwheat series, Chamise series, Chamise - bigberry manzanita series, Chamise - white sage series, Chamise - black sage series, Chamise - hoaryleaf ceanothus series, Chaparral whitethorn series, Cupleaf ceanothus - fremontia - oak series, Fourwing saltbush series, Hairyleaf ceanothus series, Hoaryleaf ceanothus series, Hop-sage series, Mixed saltbush series, Mixed scrub oak series, Mountain whitethorn series, Mulefat series, Nolina series, Parry rabbitbrush series, Scalebroom series, Scrub oak series, Scrub oak - chaparral whitethorn series, Shadscale series, White sage series.

Forests and woodlands: Birchleaf mountain-mahogany series, California juniper series, Coulter pine series, Coulter pine - canyon live oak series, Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Canyon live oak series, Coast live oak series, Curlleaf mountain-mahogany series, Ponderosa pine series, Singleleaf pinyon series.

Climate. The mean annual precipitation is about 20 to 30 inches. Most of it is rain. Mean annual temperature is about 45° to 60° F. The mean freeze-free period is about 200 to 275 days.

Surface Water. Runoff is rapid. All but the larger streams are dry through the summer. Natural lakes are absent, except along the San Andreas fault. There are some sag ponds along the San Andreas fault.

Subsection M262Be Upper San Gabriel Mountains

This subsection comprises the higher and cooler parts of the San Gabriel Mountains. The climate is temperate to cold and subhumid. MLRA 20e.

Lithology and Stratigraphy. This subsection contains mostly Mesozoic granitic rocks and Pre-Cretaceous Pelona schist. Also, there are some Pre-Cambrian plutonic and metamorphic rocks and small areas of Quaternary alluvium.

Geomorphology. This is a subsection of steep and very steep mountains with narrow to rounded summits and narrow canyons. The mountains trend east-west. The subsection elevation range is from about 5000 feet, or lower on north-facing slopes, up to 10,080 feet on Mount San Antonio (Old Baldy). Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic Xerorthents, shallow Entic Haploxerolls, Lithic Haploxerolls, and Xerochrepts. There are some small areas of Xerofluvents and Haploxerolls on Quaternary alluvium. Most of the soils are leached free of carbonates. The soils are well drained. Soil temperature regimes are mostly mesic, and some are frigid. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Coulter pine series, Mixed conifer series on the south side, and Jeffrey pine series on the north side of the mountains. Lodgepole pine series is common at the highest elevations, and Limber pine series occurs on dry slopes.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, Bur-reed series, Shorthair sedge series, Tufted hairgrass series.

Shrublands: Bush chinquapin series, Chamise series, Deerbrush series, Eastwood manzanita series, Greenleaf manzanita series, Holodiscus series, Mixed scrub oak series, Mountain whitethorn series, Parry rabbitbrush series, Rothrock sagebrush series, Rubber rabbitbrush series, Scrub oak series, Scrub oak - chaparral whitethorn series.

Forests and woodlands: Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Birchleaf mountain-mahogany series, Black cottonwood series, Canyon live oak series, Coast live oak series, Curlleaf mountain-mahogany series, Coulter pine series, Coulter pine - canyon live oak series, Incense-cedar series, Jeffrey pine series, Limber pine series, Lodgepole pine series, Mixed conifer series, Mixed subalpine forest series, Mountain juniper series, Ponderosa pine series, White fir series.

Climate. The mean annual precipitation is about 30 to 40 inches; much of it is snow. Mean annual temperature is about 40° to 50° F. The mean freeze-free period is about 150 to 225 days.

Surface Water. Runoff is rapid. All but the larger streams are dry through the summer. Natural lakes are absent.

Subsection M262Be, Crystal Lake Basin area — *Robert Ettner*

Subsection M262Bf Santa Ana Mountains

This subsection includes the Puente and Chino Hills, which are northwest of the Santa Ana River, and most of the Santa Ana Mountains, which are southeast of the Santa Ana River. The climate is hot and subhumid; it is modified moderately by marine influence. MLRA 20d.

Lithology and Stratigraphy. This subsection contains mostly Jurassic marine clastic sedimentary, Jurassic volcanic, and Mesozoic granitic rocks. There is some mafic plutonic rock and small areas of Pleistocene basalt. The Puente and Chino Hills consist of Miocene marine sedimentary rocks.

Geomorphology. This is a subsection of steep to very steep mountains with narrow to rounded summits and narrow canyons. There are some rolling plateau surfaces, also. The hills northwest of the Santa Ana River are steep. These hills and the Santa Ana Mountains trend northwest. The Santa Ana Mountains are bounded on the northeast by a steep escarpment along the Elsinore Fault Zone, and the Puente and Chino Hills are bounded on

Subsection M262Bf, San Mateo Canyon area — *Robert Ettner*

the south-southwest by the Whittier Fault Zone. The subsection elevation range is from about 300 feet along the Santa Ana River up to 5687 feet on Santiago Peak. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly shallow Typic Xerorthents, Typic Xerochrepts, and Typic Haploxeralfs on granitic rocks and Lithic Xerorthents, Lithic Haploxerolls, and Typic Haploxeralfs on Jurassic sedimentary and volcanic rocks. They are Calcic and Pachic Haploxerolls and Typic Argixerolls on Miocene sedimentary rocks. Rhodoxeralfs and Haploxeralfs predominate on mafic plutonic and volcanic rocks. Most of the soils, except those in the Puente and Chino Hills, are leached free of carbonates. The soils are well drained. Soil temperature regimes are mostly thermic, but some are mesic on north-facing slopes at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Coast live oak series, Chamise series, which is generally on shallow or very stony soils on south-facing slopes, Manzanita chaparral shrublands, and Mixed scrub oak series. Some Bigcone Douglas-fir series occurs on north-facing slopes, Canyon live oak series occurs in canyons, California sagebrush series occurs on south-facing slopes at lower elevations, and Coulter pine series occurs at higher elevations.

Characteristic series by lifeform include:

Vernal pools: Santa Rosa Plateau vernal pools.

Grasslands: California annual grassland series, Purple Needlegrass series.

Shrublands: California buckwheat series, California sagebrush - black sage series, California sagebrush - California buckwheat series, Chamise series, Chamise - black sage series, Chamise - white sage series, Chamise - hoaryleaf ceanothus series, Eastwood manzanita series, Hairyleaf ceanothus series, Hoaryleaf ceanothus series, Mixed scrub oak series, Scrub oak series, Scrub oak - chaparral whitethorn series, Scrub oak - chamise series, Sumac series, White sage series.

Forests and woodlands: Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Black oak series, Canyon live oak series, Coast live oak series, Coulter pine series, Coulter pine - canyon live oak, Coast live oak series, Engelmann oak series, Interior live oak series, Knobcone pine series, Tecate cypress stands.

Climate. The mean annual precipitation is about 15 to 25 inches. Most of it is rain, except at higher elevations. Mean annual temperature is about 45° to 62° F. The mean freeze-free period is about 200 to 300 days.

Surface Water. Runoff is rapid. All but the larger streams are dry through the summer. Natural lakes are absent, but some of the streams drain to Lake Elsinore on the northeast side of the subsection.

Subsection M262Bg San Gorgonio Mountains

This subsection comprises the lower and warmer parts of the San Bernardino Mountains, which are between the southern branch of the San Andreas fault on the south-southwest and the Mojave Desert on the north. It extends from the Cajon Pass eastward to near the Pipes Canyon fault. It includes mountains between the Mission Creek fault and the Banning fault on the south. The climate is hot to temperate and subhumid. Marine effects on climate are moderate on the south-southwest side and slight on the north and east sides of the mountains. MLRA 20e.

Lithology and Stratigraphy. This subsection contains mostly Mesozoic granitic rocks and Pre-Cambrian

Subsection M262Bg, North Fork Mohave River area — *Robert Ettner* igneous and metamorphic rocks. Also, there is some Paleozoic marine sedimentary rock and minor amounts of Pliocene nonmarine sediments. The mountains are a horst with faults and steep escarpments on the south-southwest, east-northeast, and west-northwest sides. Quaternary nonmarine sediments and Recent alluvium are small but important components of the subsection.

Geomorphology. This is a subsection of steep and very steep mountains with narrow to rounded summits and narrow canyons. The subsection elevation range is from about 1500 feet up to 6000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly shallow Typic Xerorthents, shallow Entic Haploxerolls, Entic Ultic Haploxerolls, and Mollic Haploxeralfs on granitic and Pre-Cambrian rocks and Lithic and Typic Xerochrepts on Paleozoic marine sedimentary rocks. On Recent alluvium and Quaternary marine sediments there are Typic and Mollic Xerofluvents and Ultic Argixerolls. Most of the soils are leached free of carbonates. The soils are well drained. Soil temperature regimes are thermic at lower elevations and on south-facing slopes, and some are mesic on north-facing slopes at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Chamise series on shallow and very stony soils, Live oak chaparral shrublands, and Mixed chaparral shrublands at lower elevations and on south-facing slopes; Ponderosa pine series and Mixed conifer series at higher elevations; and Jeffrey pine series on the north side of the mountains.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Desert needlegrass series.

Shrublands: Bigberry manzanita series, Bitterbrush series, Black bush series, California buckwheat series, California sagebrush series, Chamise series, Chamise - bigberry manzanita series, Chamise - Eastwood manzanita series, Chamise - hoaryleaf ceanothus series, Chamise - cupleaf ceanothus series, Chamise - white sage series, Chamise - black sage series, Chaparral whitethorn series, Cupleaf ceanothus - fremontia - oak series, Eastwood manzanita series, Fourwing saltbush series, Hoaryleaf ceanothus series, Scrub oak series, Scrub oak chaparral - whitethorn series, Interior live oak shrub series, Interior live oak - chaparral whitethorn series, Interior live oak - scrub oak shrub series, Interior live oak - canyon live oak shrub series, Mixed scrub oak series, Mulefat series, Scrub oak series, Scrub oak - chamise series, Scrub oak - chaparral whitethorn series, Scalebroom series.

Forests and woodlands: Birchleaf mountain-mahogany series, California juniper series, California walnut series, Coulter pine series, Coulter pine - canyon live oak series, Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Black oak series, Canyon live oak series, Coast live oak series, Curlleaf mountain-mahogany series, Knobcone pine series, Interior live oak series, Jeffrey pine series, Mixed conifer series, Ponderosa pine series, Singleleaf pinyon series, Singleleaf pinyon - Utah Juniper series.

Climate. The mean annual precipitation is about 20 to 30 inches. Most of it is rain at lower elevations and snow at higher elevations. Mean annual temperature is about 45° to 60° F. The mean freeze-free period is about 200 to 250 days.

Surface Water. Runoff is rapid. All but the larger streams are dry through the summer. Natural lakes are absent.

Subsection M262Bh Upper San Gorgonio Mountains

This subsection comprises the higher elevations and cooler parts of the San Bernardino Mountains. The climate is temperate to cold, and subhumid. MLRA 22d.

Lithology and Stratigraphy. This subsection contains mostly Mesozoic granitic rocks. Also, there are some Pre-Cambrian gneiss and Paleozoic marine sedimentary rocks. The mountains are a horst with faults and steep escarpments on the south-southwest, east-northeast, and west-northwest sides. Quaternary nonmarine sediments and Recent alluvium are small but important components of the subsection.

Geomorphology. This is a subsection of steep and very steep mountains with narrow to rounded summits. There is a high rolling plateau surface at about 6500 to

Subsection M262Bh, Onyz Peak area — *Robert Ettner*

7500 feet with some Quaternary fluvial and lacustrine deposits on it. The subsection elevation range is from about 4000 feet up to 11,502 feet on Mount San Gorgonio. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly shallow Typic Xeropsamments, Typic Xerochrepts, Pachic Xerumbrepts, and Ultic Argixerolls. Also, there are Mollic Xerofluvents on late Quaternary alluvium. The soils are leached free of carbonates. The soils are well drained. Soil temperature regimes are mostly mesic, and some frigid at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant community is Ponderosa pine series. There are small areas of Coulter pine series, Mixed chaparral shrublands, Jeffrey pine series on the north side of the mountains, and small areas of Limber pine series. Lodgepole pine series is common at higher elevations.

Characteristic series by lifeform include:
Grasslands: Alpine habitat, Beaked sedge series, Bur-reed series, Creeping ryegrass series, Shorthair sedge series, Sedge series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Black sagebrush series, Bush chinquapin series, Deerbrush series, Eastwood manzanita series, Greenleaf manzanita series, Interior live oak - chaparral whitethorn series, Interior live oak - canyon live oak shrub series, Interior live oak - scrub oak shrub series, Mixed saltbush series, Mixed scrub oak series, Mountain whitethorn series, Rothrock sagebrush series, Rubber rabbitbrush series, Scrub oak series, Scrub oak - chamise series.

Forests and woodlands: Aspen series, Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Black cottonwood series, Black oak series, Canyon live oak series, Coulter pine - canyon live oak series, Curlleaf mountain-mahogany series, Incense-cedar series, Jeffrey pine series, Jeffrey pine - Ponderosa pine series, Limber pine series, Lodgepole pine series, Mixed conifer series, Mixed subalpine forest series, Mountain juniper series, Singleleaf pinyon series, White fir series.

Climate. The mean annual precipitation is about 30 to 40 inches. Much of it is snow. Mean annual temperature is about 40° to 50° F. The mean freeze-free period is about 150 to 200 days.

Surface Water. Runoff is rapid. All but the larger streams are dry through the summer. There have been natural lakes on the high plateau recently, but any lakes that persisted until historical time have been replaced by reservoirs.

Subsection M262Bi Little San Bernardino - Bighorn Mountains

This subsection includes the Bighorn Mountains, the northern edge of the San Bernardino Mountains and the Little San Bernardino Mountains. It is bounded by the Mojave Desert on the north and northeast and by the Coachella Valley on the southwest. This is the hot and dry eastern end of the Transverse Ranges. MLRAs 20e, 29f, and 30g.

Lithology and Stratigraphy. This subsection is mostly Mesozoic granitic rocks and Pre-Cambrian gneiss. Also, there is some Paleozoic marine sedimentary rock and Quaternary nonmarine sediments. There is Recent alluvium in Morongo Valley.

Geomorphology. The Bighorn Mountains are an appendage of the San Gorgonio Mountains, separated from it by the Pipes Canyon fault. Broad, dissected pediments slope east-northeast across the Bighorn Mountains. The general trends of these slopes are on the order of 4 to 12%, but the actually gradients to drainage ways are greater. The Little San Bernardino Mountains, which are separated from the Bighorn Mountains by the Morongo Valley fault, are steep and very steep mountains with narrow canyons. They trend northwest, parallel to the Mission Creek fault in the San Andreas Fault Zone. The subsection elevation range is from about 500 feet up to 5500 feet. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Xerochrepts, Entic Ultic Haploxerolls, and Mollic Haploxeralfs. In the Little San Bernardino Mountains there are these plus Lithic Torriorthents and Lithic Camborthids. On Quaternary nonmarine sediments there are Typic Torripsamments, Typic Haplargids, and Haplic Durargids, and in Recent alluvium, Typic and Mollic Xerofluvents, Typic Xerorthents, and Typic Haploxeralfs. The soils are well drained. Soil temperature regimes are mostly thermic, and some soils on north-facing slopes at higher elevations are mesic. Soil moisture regimes are xeric (nearly aridic) and aridic. Most of the soils with aridic moisture regimes are in the Little San Bernardino Mountains.

Vegetation. The predominant natural plant communities are Singleleaf pinyon series, California juniper series, and Mixed chaparral shrublands. Creosote bush series, some Mojave yucca series, and Joshua tree series, occur in areas with aridic soil moisture regimes.

Characteristic series by lifeform include:
Grasslands: California annual grassland series.

Shrublands: Big sagebrush series, Black bush series, Catclaw acacia series, Chamise series, Chamise - cupleaf ceanothus series, Creosote bush series, Cupleaf ceanothus - fremontia - oak series, Fourwing saltbush series, Joshua tree series, Mixed saltbush series, Mojave yucca series, Mulefat series, Nolina series, Scalebroom series, Scrub oak series, Shadscale series.

Forests and woodlands: Birchleaf mountain-mahogany series, California juniper series, Curlleaf mountain-mahogany series, Singleleaf pinyon series.

Climate. The mean annual precipitation is about 6 to 20 inches. Most of it is rain. Mean annual temperature is about 55° to 70° F. The mean freeze-free period is about 200 to 275 days.

Surface Water. Runoff is rapid. All but the larger streams are dry through the summer, and water runs in them only after rain in the Little San Bernardino Mountains. Natural lakes are absent.

Subsection M262Bj Fontana Plain - Calimesa Terraces

This subsection includes alluvial fans in San Gorgonio Pass; basin floor in the Redlands area, between the San Andreas and San Jacinto Faults; and a basin that is separated from the Los Angeles Basin by the Chino, Puente, and San Jose Hills on the west side of the subsection. It is just south of the San Gabriel and the San Bernardino Mountains. The climate is hot and subhumid; it is moderated by marine influence. MLRA 19d.

Lithology and Stratigraphy. This subsection contains mostly Quaternary nonmarine sediments and Recent alluvium. There are some Mesozoic granitic rocks and older sedimentary and metamorphic rocks in the Jurupa Mountains and other hills that are included in this subsection.

Geomorphology. This subsection is on very gently to gently sloping alluvial fans, mostly from the San Gabriel and San Bernardino Mountains, and some floodplain along the Santa Ana River and its larger tributaries. A few areas of hills are included in this subsection. The subsection elevation range is from about 600 feet up to 2400 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Xeropsamments, Typic Xerorthents, Fluventic Haploxerolls, and Typic Haploxeralfs. There are Haplic and Typic Durixeralfs on old alluvial fans. Carbonates have accumulated in some of the soils and silica has accumulated in the older soils. The soils are well drained. Soil temperature regimes are thermic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are California sagebrush - California buckwheat series and Needlegrass grasslands.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Foothill needlegrass series, Nodding needlegrass series, Purple needlegrass series.

Shrublands: Brittlebush series, Bush seepweed series, California buckwheat series, California buckwheat - white sage series, California sagebrush series, California sagebrush - California buckwheat series, California sagebrush - black sage series, Chamise series, Chamise - California buckwheat - white sage series, Fourwing saltbush series, Mixed saltbush series, Scalebroom series, White sage series.

Forests and woodlands: California juniper series, California sycamore series.

Climate. The mean annual precipitation is about 12 to 20 inches; most of it is rain. Mean annual temperature is about 62° to 64° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Runoff is rapid, even from the alluvial fans. All but the larger streams are dry through the summer. Water runs in the Santa Ana River throughout the year. Natural lakes are absent.

Subsection M262Bk Perris Valley and Hills

This subsection consists of hills and valleys in a graben between the San Jacinto Fault on the northeast and the Elsinore Fault zone on the southwest. It stretches from the Santa Ana River southeast beyond Perris Valley. The climate is hot; it is modified somewhat by marine influence. MLRAs 19d and 20d.

Lithology and Stratigraphy. This subsection contains mostly Mesozoic granitic, gabbroic, marine (Jurassic) sedimentary, and metavolcanic rocks in the hills. The valleys are filled with Quaternary alluvium.

Geomorphology. This subsection is on moderately steep to steep hills, pediments, dissected Quaternary nonmarine sediments adjacent to the Elsinore Fault Zone and near the Santa Ana River, and Recent alluvium in Perris Valley and along the Elsinore Fault Zone. The subsection elevation range is from about 1400 feet to 2600 feet. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly shallow Typic Xerorthents and Typic Haploxeralfs on hills and pediments in granitic terrain and Lithic Haploxerolls, Mollic Haploxeralfs, and Typic Natrixeralfs on other hills. On Recent alluvium there are Typic Xerofluvents, Fluventic and

Fluvaquentic Haploxerolls. There are Natric Haploxeralfs, Haplic and Typic Durixeralfs, and Typic Pelloxererts on dissected nonmarine Quaternary deposits and terraces. Carbonates have accumulated in some of the soils and silica has accumulated in the older soils. The soils are well drained, except for somewhat poorly drained Fluvaquentic Haploxerolls in Recent alluvium. Soil temperature regimes are thermic, and soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are California sagebrush - California buckwheat series and Needlegrass grasslands. There is some Black sage series and small areas of Coast live oak series and Chamise series.

Characteristic series by lifeform include:

Vernal pools: San Jacinto Valley vernal pools.

Grasslands: California annual grassland series, Foothill needlegrass series, Nodding needlegrass series, Saltgrass series.

Shrublands: Bush seepweed series, California buckwheat series, California buckwheat - white sage series, California sagebrush series, California sagebrush - California buckwheat series, Chamise - hoaryleaf ceanothus series, Chamise - white sage series, Fourwing saltbush series, Mixed saltbush series, Scalebroom series, Scrub oak series, White sage series.

Forests and woodlands: Birchleaf mountain-mahogany series, California juniper series, Coast live oak series.

Climate. The mean annual precipitation is about 10 to 16 inches. It is practically all rain. Mean annual temperature is about 58° to 64° F. The mean freeze-free period is about 225 to 250 days.

Surface Water. Runoff is rapid, except from floodplains and lake basins. All but the larger streams are dry through the summer. There are sag ponds along the Elsinore Fault Zone, Lake Elsinore being the largest. Also, there are several reservoirs in the subsection.

Subsection M262BI San Jacinto Foothills - Cahuilla Mountains

This subsection includes the lower southwestern slopes of the San Jacinto Mountains, hills along the northeast side of the San Jacinto Fault, and hills and valleys around the Cahuilla Mountains on the southwest side of the San Jacinto Fault. The climate is hot to temperate, and subhumid. MLRA 20d.

Subsection M262BI, South Fork San Jacinto River area — *Robert Ettner*

Lithology and Stratigraphy. This subsection contains mostly Mesozoic granitic rocks, with large areas of Pliocene and Pleistocene nonmarine sediments and Recent alluvium. Also, there are Pre-Cretaceous granitic, marine (Jurassic) sedimentary, and metamorphic rocks.

Geomorphology. This subsection is on lower mountain slopes, moderately steep to steep hills, and nearly level to gently sloping alluvial plains in Terwilliger Valley and other small valleys. There are alluvial fans, terraces, and floodplains on the alluvial plains. Pliocene and some Pleistocene nonmarine sediments along the San Jacinto Fault northwest of the Cahuilla Mountains have been eroded to badlands. The subsection elevation range is from about 1500 feet to 4000 feet. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils on granitic rocks are mostly shallow Typic Xerorthents, Typic Xerochrepts, and Typic Haploxeralfs at lower elevations and shallow Entic Haploxerolls, Entic Ultic Haploxerolls, and Mollic Haploxeralfs at higher elevations. There are Lithic Haploxerolls and Typic Natrixeralfs on other kinds of rocks. Soils in badlands are Xerorthents. Haploxerolls predominate in Recent alluvium. Calcium carbonates have accumulated in some of the soils at lower elevations. The soils are well drained. Soil temperature regimes are mostly thermic; and soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Coast Live oak series, California sagebrush - California buckwheat series, and Black sage series at lower elevations southwest of the San Jacinto Fault, and some Chamise series and Red shank - chamise series.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Foothill needlegrass series, Nodding needlegrass series, Purple needlegrass series.

Shrublands: Big sagebrush series, Bigberry manzanita series, Brittlebush series, California buckwheat series, California buckwheat - white sage series, California sagebrush series, California sagebrush - black sage series, California sagebrush - California buckwheat series, Chamise series, Chamise - bigberry manzanita series, Chamise - black sage series, Chamise - white sage series, Chamise - wedgeleaf ceanothus series, Chamise - mission-manzanita - woollyleaf ceanothus series, Red shank series, Red shank - chamise series, Red shank - birchleaf mountain-mahogany series.

Forests and woodlands: Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Birchleaf mountain-mahogany series, California juniper series, Coulter pine series, Coulter pine - canyon live oak series, Coast live oak series, Parry pine series, Singleleaf pinyon series.

Climate. The mean annual precipitation is about 10 to 20 inches. It is practically all rain. Mean annual temperature is about 50° to 60° F. The mean freeze-free period is about 200 to 250 days.

Surface Water. Runoff is rapid, except from nearly level alluvial plains. All but the larger streams are dry through the summer. There are no natural lakes.

Subsection M262Bm San Jacinto Mountains

This subsection consists of the higher and cooler parts of the San Jacinto and the Cahuilla Mountains. The climate is temperate to cold, and subhumid; it is affected by elevation much more than by marine influence. MLRAs 22d and 22e.

Lithology and Stratigraphy. The San Jacinto Mountains contain mostly Mesozoic granitic rocks and the Cahuilla Mountains contain mostly Pre-Cenozoic granitic and metamorphic rocks. Also, there are large areas of Pre-Cretaceous metasedimentary rocks and small areas of Pleistocene sediments.

Geomorphology. This subsection is on steep to very steep mountains with narrow to rounded ridges and narrow canyons, except where there are Quaternary fluvial landforms along the Hot Springs Fault and the San Jacinto Fault Zone. The subsection elevation range is from about 3000 feet up to 10831 feet on Mount San Jacinto. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly shallow Typic Xerorthents, Lithic Xerorthents, Typic Xerochrepts, Entic and Entic Ultic Haploxerolls, Argixerolls, Pachic Xerumbrepts, and Mollic Haploxeralfs. Soils on Pleistocene nonmarine sediments are mostly Haploxerolls. Calcium carbonates are leached from the soils. The soils are well drained. Soil temperature regimes are mostly mesic, and some are frigid at higher elevations. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Ponderosa pine series and Mixed conifer series on the southwest side of the San Jacinto Mountains, Jeffrey pine series on the northeast side of the San Jacinto Mountains and on both sides at higher elevations, Lodgepole pine series at very high elevations, and Mixed chaparral shrublands at lower elevations. Canyon live oak series occurs in steep canyons. There is some Singleleaf pinyon series and California juniper series at lower elevations on the northeast side of the mountains.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Desert needlegrass series, Sedge series, Quillwort series.

Shrublands: Big sagebrush series, Bigberry manzanita series, Bush chinquapin series, California buckwheat - white sage series, Chamise series, Chamise - cupleaf ceanothus series, Chamise - wedgeleaf ceanothus series, Chamise - white sage series, Deerbrush series, Eastwood manzanita series, Greenleaf manzanita series, Interior live oak shrub series, Interior live oak - chaparral whitethorn shrub series, Holodiscus series, Mixed scrub oak series, Mountain whitethorn series, Red shank series, Red shank - birchleaf mountain-mahogany series, Red shank - chamise series, Rothrock sagebrush series, Scrub oak series, White sage series.

Forests and woodlands: Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Birchleaf mountain-mahogany series, Black oak series, California juniper series, Canyon live oak series, Coulter pine series, Coulter pine - canyon live oak series, Curlleaf mountain-mahogany series, Coast live oak series, Incense-cedar series, Interior live oak series, Jeffrey pine series, Limber pine series, Lodgepole pine series, Mixed subalpine forest series, Mixed conifer series, Parry pinyon series, Ponderosa pine series, Singleleaf pinyon series, White fir series.

Climate. The mean annual precipitation is about 16 to 30 inches. It is mostly rain at lower and snow at higher elevations. Mean annual temperature is about 40° to 58° F. The mean freeze-free period is about 150 to 225 days.

Surface Water. Runoff is rapid, except from nearly level alluvial plains. All but the larger streams are dry through the summer. There are no natural lakes.

Subsection M262Bn Western Granitic Foothills

This subsection comprises the mountains and hills at intermediate elevations on the southwest, or coastal, side of the Peninsular Ranges. It extends from the Santa Ana

Subsection M262Bn, Pine Hills area, Inaja Indian Reservation — *Robert Ettner*

Mountains southeastward to the Mexican border. The northern part of the subsection is bounded on the northwest by the Elsinore Fault Zone. The southwestern edge of the subsection is near a line through the San Marcos Mountains, Woodson Mountain, Iron Mountain, Sequan Peak, and Otay Mountain. The climate is hot and subhumid; it is modified moderately by oceanic influence. MLRA 20d.

Lithology and Stratigraphy. This subsection contains mostly Mesozoic granitic rocks. There are some Pre-Cenozoic granitic and metamorphic rocks and some Mesozoic mafic plutonic rocks, also. There are small areas of Pleistocene sediment and Recent alluvium.

Geomorphology. This is a subsection of moderately steep to steep mountains and hills with narrow to rounded summits and narrow to broad canyons. There are some rolling plateau surfaces, too. The streams run southwestward toward the ocean, but San Luis Rey River initially runs parallel to the trend of the Peninsular Ranges and takes a 90° turn before running to the ocean. Many of the streams have alluvial plains a few hundred yards wide, or even wider in places. The subsection elevation range is about 1200 feet to 4000 feet. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly shallow Typic Xerorthents, Typic Xerochrepts, and Typic Haploxeralfs on granitic rocks. Also, there are Rhodoxeralfs on mafic plutonic (diorite and gabbro) rocks and Lithic Xerorthents, Haploxerolls, and Haploxeralfs on other kinds of rocks. The soils of floodplains and terraces are mostly Typic Xeropsamments, Cumulic Haploxerolls, and Typic Haploxeralfs. Most of the soils are leached free of carbonates. The soils are well drained. The soil temperature regimes are mostly thermic. Soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities are Coast live oak series, Chamise series, which is generally on shallow or very stony soils on south-facing slopes, Mixed chaparral shrublands, and Coastal sagebrush series.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Foothill needlegrass series, Nodding needlegrass series, Purple needlegrass series.

Shrublands: California buckwheat series, Chamise series, Chamise - Eastwood manzanita series, Chamise - bigberry manzanita series, Chamise - cupleaf ceanothus series, Eastwood manzanita series, Chamise - mission-manzanita - woollyleaf ceanothus series, Chamise - white sage series, California sagebrush - California buckwheat series, Chaparral whitethorn series, California buckwheat - white sage series, Mixed scrub oak series, Scrub oak series, Scrub oak - chamise series, Scrub oak - chaparral whitethorn series, Scrub oak - birchleaf mountain-mahogany series, Sumac series, White sage series.

Forests and woodlands: Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Birchleaf mountain-mahogany series, Black oak series, Coulter pine series, Coulter pine - canyon live oak series, Coast live oak series, Engelmann oak series, Tecate cypress stands.

Climate. The mean annual precipitation is about 14 to 20 inches. Most of it is rain. Mean annual temperature is about 55° to 62° F. The mean freeze-free period is about 200 to 275 days.

Surface Water. Runoff is rapid. All but the larger streams are dry through the summer. Natural lakes are absent.

Subsection M262Bo Palomar - Cuyamaca Peak

This subsection comprises the higher mountains of the Peninsular Ranges from Agua Tibia Mountain southeastward to the Mexican border. The climate is temperate and subhumid; it is affected by elevation more than by marine influence. MLRA 22c.

Lithology and Stratigraphy. This subsection contains mostly Mesozoic granitic rocks. Also, there are some Pre-Cenozoic granitic and metamorphic rocks and some Mesozoic mafic plutonic rocks. There are small areas of Pleistocene sediment and Recent alluvium.

Geomorphology. This is a subsection of moderately steep to steep mountains with rounded summits, broad valleys,

Subsection M262Bo, Corte Madera area — *Robert Ettner*

and rolling plateaus. There is a drainage divide in the subsection, between streams running southwest to the coast and streams running east to the Salton Trough. The subsection elevation range is from about 2000 feet up to 6140 feet on Palomar Mountain and 6515 feet on Cuyamaca Peak. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly shallow Entic Haploxerolls, Entic and Ultic Haploxerolls, and Mollic and Ultic Haploxeralfs. Also, there are Rhodoxeralfs on mafic plutonic (diorite and gabbro) rocks. The soils on alluvium in valleys are mostly Haploxerolls. The soils are leached free of carbonates. They are well drained. Soil temperature regimes are mostly mesic, and soil moisture regimes are xeric.

Vegetation. The predominant natural plant communities at lower elevations are Chamise series, which is typically on shallow or stony soils, Mixed chaparral shrublands, and Live oak chaparral shrublands. Coast live oak series and Needlegrass grasslands are common in valleys. There are small areas of Engelmann oak series. The predominant natural plant communities at higher elevations are Coulter pine series, Jeffrey pine series, Bigcone Douglas-fir series, Mixed conifer series, and Black oak series. Also, there are Montane meadow habitats. Cuyamaca cypress stands and Tecate cypress stands are unique in this subsection.

Characteristic series by lifeform include:

Grasslands: Foothill needlgrass series, Nodding needlegrass series, Purple needlegrass series, Quillwort series.

Shrublands: California sagebrush - California buckwheat series, California buckwheat - white sage series, Chamise series, Chamise - bigberry manzanita series, Chamise - white sage series, Chamise - cupleaf ceanothus series, Chamise - Eastwood manzanita series, Chamise - mission-manzanita - woollyleaf ceanothus series, Chaparral whitethorn series, Greenleaf manzanita series, Mixed scrub oak series, Mountain whitethorn series, Scrub oak series, Scrub oak - birchleaf mountain-mahogany series, Scrub oak - chamise series, Scrub oak - chaparral whitethorn series, White sage series.

Forests and woodlands: Bigcone Douglas-fir series, Bigcone Douglas-fir - canyon live oak series, Birchleaf mountain-mahogany series, Black oak series, Canyon live oak series, Coulter pine series, Coulter pine - canyon live oak series, Coast live oak series, Cuyamaca cypresses stands, Engelmann oak series, Incense-cedar series, Interior live oak series, Jeffrey pine series, Mixed conifer series, Ponderosa pine series, Parry pine series, White fir series.

Climate. The mean annual precipitation is about 18 to 40 inches; most of it is rain. Mean annual temperature is about 50° to 58° F. The mean freeze-free period is about 200 to 250 days.

Surface Water. Runoff is rapid. All but the larger streams are dry through the summer. There are sag ponds along the Elsinore Fault Zone, but Lake Henshaw is the only natural lake, and its level has been raised artificially. There are some reservoirs in the subsection.

Subsection M262Bp Desert Slopes

This subsection comprises the dry interior side of the Peninsular Ranges, from San Gorgonio Pass to the Mexican border. It includes the lower slopes of the San Jacinto Mountains and all but the highest parts of the Santa Rosa Mountains. The climate is hot and semi-arid to subhumid. MLRAs 20e, 20f, 29f.

Lithology and Stratigraphy. This subsection contains mostly Mesozoic granitic and Pre-Cenozoic metamorphic rocks. There is some Pleistocene sediment and Recent alluvium and small areas of Miocene volcanic rocks and Miocene and Pliocene nonmarine sediments.

Geomorphology. This is a subsection of moderately steep to steep mountains with narrow to rounded summits and both narrow canyons and broad valleys. There are small areas of rolling plateau. The valleys are occupied by Pleistocene to Recent alluvial fans. The subsection elevation range is from about 300 feet up to 5261 feet on Asbestos Mountain. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Lithic and shallow Typic Xerorthents, Lithic Xerochrepts, Haploxerolls, and Mollic Haploxeralfs. In badland areas at lower elevations, they are mostly shallow Typic Torriorthents and Typic Camborthids. The soils on alluvial fans are mostly

Subsection M262Bp, view toward Anza-Borrego State Park from Laguna Mountains — *Robert Ettner*

Typic Torrifluvents, Torripsamments, Typic Toriorthents, and Typic Haplargids. Carbonates accumulate in the soils. They are well drained. The soil temperature regimes are mostly thermic. Soil moisture regimes are xeric (nearly aridic) and aridic.

Vegetation. The natural plant communities are mostly Creosote bush series and Creosote bush - white bursage series, Chamise series and Red shank - chamise series, Mixed chaparral shrublands, Singleleaf pinyon series, and California juniper series.

Characteristic series by lifeform include:
Grasslands: Foothill needlgrass series, Nodding needlegrass series, Purple needlegrass series.

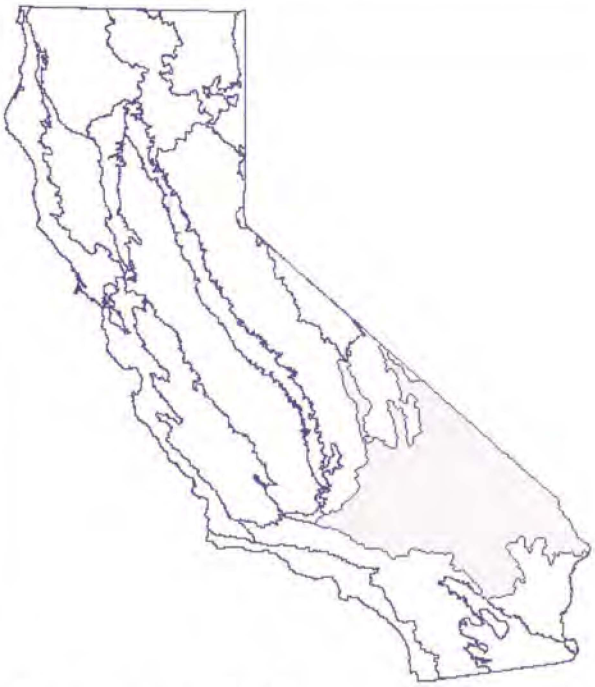
Shrublands: Big sagebrush series, Bitterbrush series, Brittlebush series, Brittlebush - white sage series, California buckwheat - white sage series, Creosote bush series, Creosote bush - white bursage series, Chamise series, Chamise cupleaf ceanothus series, Cupleaf ceanothus - fremontia - oak series, Fourwing saltbush series, Mixed salbush series, Mulefat series, Nolina series, Red shank - birchleaf mountain-mahogany series, Red shank - chamise series, Scalebroom series, Shadscale series, White sage series.

Forests and woodlands: Birchleaf mountain-mahogany series, California juniper series, Canyon live oak series, Coast live oak series, Parry pine series, Singleleaf pinyon series.

Climate. The mean annual precipitation is about 4 to 20 inches. Most of it is rain. Mean annual temperature is about 55° to 70° F. The mean freeze-free period is about 200 to 275 days.

Surface Water. Runoff is rapid. The streams are dry through the summer. They drain to the Salton Trough or sink into the ground before reaching the Salton Trough. There are no lakes in the subsection.

CHAPTER 14



Section 322A
Mojave Desert

This section is the hot part of the Basin and ranges from the southern end of the Sierra Nevada and the north-northeastern side of the Transverse Ranges to Nevada and Arizona. Most of it is in MLRA 30, but some is in MLRA 29.

Geomorphology. Widely separated short ranges in desert plains. Contains isolated mountains, plateaus, alluvial fans, playas, basins and dunes. Basin and Range geomorphic province (Mojave Desert).

Lithology. Cenozoic nonmarine sedimentary and granitic rocks and alluvial deposits, and precambrian rocks of all types.

Soil Taxa. Aridisols and Entisols in combination with thermic or hyperthermic soil temperature regimes and aridic soil moisture regimes on foothills and valleys. Contains areas with salt affected soils. Aridisols and Entisols in combination with thermic or mesic soil temperature regimes, and aridic or xeric soil moisture regimes on mountains.

Vegetation. Predominant potential natural communities includes the Creosote bush series, Creosote bush - white bursage series, Allscale series, Mixed saltbush series, Iodine bush series, Joshua Tree series, Shadscale series, Black bush series, Mesquite series, California Juniper series, Singleleaf pinyon - Utah juniper series and White fir series (high peaks).

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

Series dominated by exotic plants: California annual grassland series, Common reed series and Tamarisk series.

Series that can occur in all subsections, but are not extensive: Bulrush series, Bulrush - cattail series, Cattail series, Cordgrass series, Duckweed series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Sedge series and Spikerush series.

Series restricted to riparian settings: Arrow weed series, Black willow series, Fremont cottonwood series, Mixed willow series, Mulefat series, Narrowleaf willow series and Red willow series.

Fauna. Mammals include desert bighorn sheep, desert kit fox, coyote, spotted skunk, spotted bat, black-tailed jackrabbit, ground squirrels, kangaroo rat and white footed mouse. Birds includes eagles, hawks, owls, quail, roadrunners, finches, warblers and orioles. Reptiles include desert tortoise, several species of rattlesnakes and chuckawalla lizard.

Elevation. 280 feet below sea level to 7900 feet above sea level.

Precipitation. 3 to 8 inches. Mostly occurs as scattered high intensity storms of short duration.

Temperature. 45° to 77°F.

Growing Season. 175 to 325 days.

Surface Water Characteristics. Mostly bedrock controlled channels in mountains that carry seasonal flows to alluvial channels below. Most channels terminate in

Section 322A, Stovepipe Wells area, Death Valley — *Charles B. Goudey* basins within the section. Some of the eastern part drains toward the Colorado River. A few reservoirs occur on the Colorado River.

Disturbance Regimes.
Fire: Areas with less than about 8 inches of rainfall rarely support enough vegetation to carry a fire. Fire occurrence in areas receiving more than about 8 inches has been influenced by introduced grasses. Fires are variable in frequency and intensity.
Climate: Flash floods are commonly associated with the irregular occurrence of precipitation events.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the late 1800's and early 1900's related to mining and grazing. Since the early 1900's, significant effects on some plant and animal species occur at widely scattered locations associated with military testing, recreational activities and rapidly expanding urbanization.

Cultural Ecology. Humans have been utilizing the area for some 10,000 years; the early Lake Mojave Paleoindian hunting assemblage is well documented at sites along the shores of Pleistocene Lake Mojave. After the end of the Pleistocene, prehistoric assemblages reflect extensive practice of seasonal rounds for resource gathering. In its southern portion, agricultural practices from Colorado River culture influences spread into the area during late prehistoric times, after A.D. 1000. Historic mining of hard rock minerals and borax altered much of the landscape. Contemporary attitudes and beliefs are varied; lifestyle is rural. The economy emphasizes government employment, mining, ranching, and recreation.

Subsections. The Mojave Desert section is divided into 16 subsections.

Subsection 322Aa
Owens Valley

This subsection is the alluvial plain in the southern part of Owens Valley, from the Poverty Hill south to Rose Valley. It includes Owens Lake. The climate is hot and dry. MLRAs 29f and 30g.

Lithology and Stratigraphy. This subsection contains mostly Quaternary alluvial fan, basin-fill, and lacustrine deposits. There is some dune sand on the east side of Owens Lake. The Alabama Hills and Poverty Hill, which protrude up through alluvial fans of Owens Valley, are Mesozoic granitic, Jurassic - Triassic volcanic, and Pre-Cretaceous metamorphic rocks. There are flows of Quaternary basalt named Aberdeen Lava over alluvial fans in the northern part of the subsection.

Subsection 322Aa, Owens Valley area with Inyo Mountains (341Fb) in background —*James R. Nelson*

Geomorphology. This subsection consists predominantly of nearly level lake plain and basin floor and gently to moderately sloping alluvial fans. Moderately steep to steep Poverty Hill and the Alabama Hills are prominent but only small parts of the subsection. The valley is oriented toward the north-northwest. The elevation range is from about 3000 to 6000 feet. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Xeric and Typic Torrifluvents, Xeric and Typic Torriorthents, and Xeric and Typic Haplargids on alluvial fans; and they are Typic Camborthids, Typic and Xeric Natrargids, Aquic Xerofluvents, and Aeric Haplaquepts on basin-fill. The lake plains are mostly playas that have only recently become exposed on the surface and still lack vascular plant cover. Soils on hills are mostly Lithic Torriorthents and Lithic Camborthids on granitic rocks and Lithic Torriorthents and Lithic Haplargids on other kinds of rocks. Soils that are on the rocky Aberdeen Lava are Vitrandic Torriorthents and Vitrandic Haplocambids. There are Typic Torripsamments on dune sand. All soils on the alluvial fans are well drained, but some in basin-fill are somewhat poorly to poorly drained. The soil temperature regimes are mostly thermic, and some mesic at higher elevations on alluvial fans. Soil moisture regimes are mostly aridic, and some xeric (nearly aridic). Wet soils in basin-fill generally have aquic moisture regimes.

Vegetation. The predominant natural plant communities are Mixed saltbush series and Greasewood series on basin-fill and Shadscale series and Hop-sage series on alluvial fans. Black bush series and some Sagebrush series occur at higher elevations on the alluvial fans. Creosote bush series is predominant south of Owens Lake.

> **Characteristic series by lifeform include:**
> *Grasslands*: Alkali sacaton series, Desert sand - verbena series, Indian ricegrass series, Saltgrass series.
>
> *Shrublands*: Allscale series, Black brush series, Desert-holly series, Fourwing saltbush series, Greasewood series, Hop-sage series, Iodine bush series, Mixed saltbush series, Rubber rabbitbush series, Scadscale series, Spinescale series.
>
> *Forests and woodlands*: Curleaf mountain-mahogany series, Water birch series.

Climate. The mean annual precipitation is about 4 to 8 inches. Most of the precipitation is rain. Mean annual temperature is about 55° to 65° F. The mean freeze-free period is from 175 to 225 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin-fill. The Owens River drains through the valley to Owens Lake. Owens Lake overflowed through Rose Valley to Indian Wells Valley during the Pleistocene, but not recently. Owens Lake is no longer a lake, although it has been historically. No surface water leaves the subsection naturally, but water is exported to Los Angeles.

Subsection 322Ab
Death Valley

This subsection is the alluvial plain of Death Valley, from Sand Spring south-southeast to the drainage divide between Death Valley and Silurian Valley. It has a very hot arid climate. MLRAs 30g and 30h.

Lithology and Stratigraphy. This subsection contains mostly Quaternary alluvial fan, basin-fill, and lacustrine deposits. There is some dune sand on the east sides of playas. Small areas of Pliocene nonmarine sedimentary rocks are included in this subsection.

Geomorphology. This subsection contains predominantly nearly level lake plain and basin floor and gently to moderately sloping alluvial fans. There are some moderately steep slopes on upper fans and Pliocene sedimentary rocks. Beach ridges and strand-lines mark the edges of former lakes. The valley is oriented toward the north-northwest. The elevation range is from -282 feet at Badwater up to about 4000 feet. Fluvial erosion and deposition and eolian deflation and deposition are the main geomorphic processes.

Subsection 322Ab, Park Village area — *Julie Nelson*

Soils. The soils are mostly Typic Torrifluvents and Typic Torriorthents, but also Typic Torripsamments, Typic Haplocalcids, Typic Haplargids, and shallow Typic Haplodurids. Lithic and shallow Typic Torriorthents are common on Pliocene sedimentary rocks. The lake plains are mostly playas that have only recently become exposed on the surface and still lack vascular plant cover. The soils are well drained. The soil temperature regimes are mostly thermic, but hyperthermic on the basin floor in the center of Death Valley. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities on fans are Desert-holly series and, higher up the fans, Creosote bush series. Desert-holly series is replaced by Allscale series toward the southern end of the valley. Brittlebush series and White bursage series are common in washes on the fans. The predominant natural plant communities on lacustrine deposits are Iodine bush series and Saltgrass series. Mesquite series and Arrow weed series are common around the edges of saltmarshes. Much of the dry lake plain is devoid of vascular plants, because of high salt content (ground water salt >6%).

> **Characteristic series by lifeform include:**
> *Grasslands*: Desert sand - verbena series, Indiana ricegrass series, Pickleweed series, Saltgrass series.
>
> *Shrublands*: Allscale series, Brittlebush series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Iodine bush series, White bursage series.
>
> *Forests and woodlands*: Mesquite series.

Climate. The mean annual precipitation is about 3 to 5 inches. It is all rain. Mean annual temperature is about

60° to 77° F. The mean freeze-free period is about 225 to 325 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin-fill. Drainage is internal, there is no outlet for surface water. The Amargosa River, which is the largest stream draining into Death Valley, is dry most of each year; but it does have several large springs along its channel. There is temporary ponding on playas, or dry lake beds.

Subsection 322Ac Amargosa Desert - Pahrump Valley

This subsection includes the alluvial plains of the Amargosa Desert, Sarcobatus Flat, Stewart Valley, Pahrump Valley, Mesquite Valley, and California Valley. There are a few moderately steep hills protruding through the alluvial plain. It has a hot and arid climate. MLRA 30g.

Lithology and Stratigraphy. This subsection contains mainly Quaternary fluvial, lacustrine, and eolian sand deposits. Hills protruding through the alluvial plain are mostly Cambrian marine sedimentary rocks.

Geomorphology. This subsection is mainly on very gently to moderately sloping alluvial fans, nearly level basin floor and dry lake bed. The Amargosa Desert, and Stewart, Pahrump, and Mesquite Valleys are in a northwest to southeast line. California Valley is oriented toward the north-northeast. Alluvial fans slope up to about 18%, but only the upper parts of them have slopes > 12 or 15%. There are large playas on the lake beds. The elevation range is from about 2280 feet in California Valley to about 5000 feet at the base of the Bullfrog Hills between the Amargosa Desert and Sarcobatus flat. Fluvial erosion and deposition and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Torripsamments and Typic Torriorthents on younger fans and Typic Calciorthids and Typic Haplargids on older fans. They are Typic Torrifluvents, Typic Torri-psamments, Typic Torriorthents, Typic Calciorthids, and shallow Typic Paleorthids on basin floor. Soils on hills are mostly Lithic Torriorthents. The soils are well drained, except on poorly drained playas. The soil temperature regimes are thermic. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant community is Creosote bush series. Joshua tree series occurs on alluvial plains. Mixed saltbush series is common on basin floors and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits. Greasewood series occurs in riparian areas and around saltmarsh.

Characteristic series by lifeform include:

Grasslands: Alkali sacaton series, Desert sand - verbena series, Indian ricegrass series, Pickleweed series, Saltgrass series.

Shrublands: Brittlebrush series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Iodine bush series, Mixed saltbush series, Scadscale series, White bursage series.

Forests and woodlands: Mesquite series.

Climate. The mean annual precipitation is about 4 to 6 inches. It is mostly rain. Mean annual temperature is about 50° to 65° F. The mean freeze-free period is about 200 to 275 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. The drainage is either internal, to sinks within the subsection, or to the Amargosa River which drains to Death Valley. California Valley drains to Silurian Valley. Streams are dry most of each year. There is temporary ponding on playas, or dry lake beds.

Subsection 322Ad Funeral Mountains - Greenwater Valley

This subsection includes the Funeral Mountains, Black Mountains, Greenwater Range, Resting Spring Range, and Nopah Range between Death Valley and the Amargosa Desert and Pahrump Valley. It includes a part of the Amargosa River valley and all of Greenwater and Chicago Valleys. The climate is hot to very hot and arid. MLRA 30g.

Lithology and Stratigraphy. This subsection contains a variety of geologic formations that can be arranged into six groups for ecological purposes: (1) a group of old rocks that are Paleozoic marine sedimentary and

Subsection 322Ad, Greenwater Valley area —*James R. Nelson*

Precambrian sedimentary and metamorphic rocks; (2) plutonic rocks, that are Mesozoic mafic and Tertiary granitic rocks; (3) Tertiary volcanic rocks that are Oligocene, Miocene, and Pliocene basaltic, rhyolitic, and pyroclastic rocks; (4) Pliocene and Quaternary nonmarine sediments, mostly alluvial fan deposits; (5) late Quaternary alluvial fan and basin-fill deposits; and (6) late Quaternary lacustrine deposits.

Geomorphology. This subsection consists of steep to very steep mountains and valleys with very gently to moderately sloping alluvial fans and nearly level basin floor and dry lake bed. The mountains are aligned north-south, or toward the north-northwest. The elevation range is from about 1000 feet up to 6703 feet on Pyramid Peak in the Funeral Mountains. There are many peaks higher than 5000 feet above sea-level. Mass wasting, fluvial erosion and deposition, and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Lithic Torriorthents and Lithic Camborthids on old sedimentary and metamorphic rocks; Lithic Torriorthents on plutonic rocks; Lithic Torriorthents and Lithic Haplargids on Tertiary volcanic rocks; Typic subgroups of Torripsamments, Torriorthents, Calciorthids, and Haplargids on Pliocene and Quaternary alluvial fans; and Typic Torripsamments and Typic Torriorthents on basin floor. The soils are well drained, except for poorly drained playas. The soil temperature regimes are mostly thermic, but hyperthermic on the basin floor along the Amargosa River. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush series on fans and lower mountain slopes and Shadscale series on higher mountain slopes. Black bush series occurs on high mountain slopes. Mixed saltbush series is common on basin floor, and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits. Greasewood series occurs in riparian areas and around saltmarsh.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, Desert sand - verbena series, Indian ricegrass series, Pickleweed series, Saltgrass series.

Shrublands: Black bush series, Brittlebrush series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Hop-sage series, Iodine bush series, Mixed saltbush series, Scadscale series, White bursage series.

Forests and woodlands: Mesquite series.

Climate. The mean annual precipitation is about 4 to 5 inches. It is all rain in the valleys, but some snow at higher elevations. Mean annual temperature is about 50° to 72° F. The mean freeze-free period is about 175 to 300 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. Most runoff drains to Death Valley, either directly from the west-southwest sides of the Funeral Mountains and Black Mountains or through the Amargosa Desert, Greenwater Valley, or Chicago Valley to the Amargosa River which drains into Death Valley. The Amargosa River, which is the largest stream draining into Death Valley, is dry most of each year; but it does have several large springs along its channel. There is temporary ponding on playas, or dry lake beds.

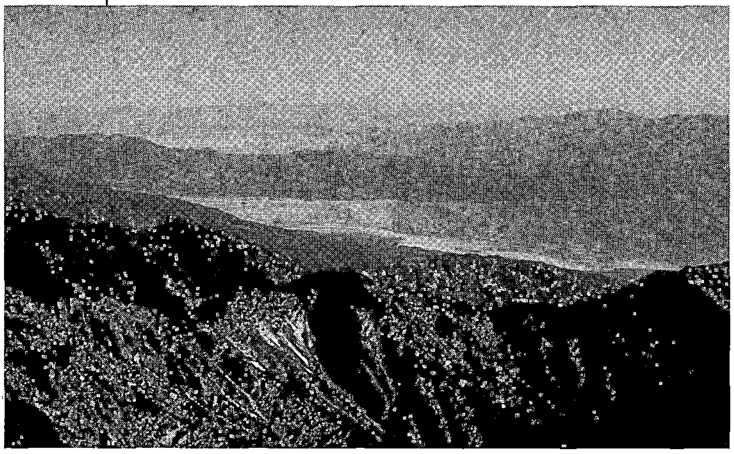
Subsection 322Ae Panamint Valley

This subsection is the alluvial plain of Panamint Valley, between the Argus and Panamint Ranges. It has a hot and arid climate. MLRA 30g.

Lithology and Stratigraphy. This subsection contains mostly Quaternary alluvial fan, basin-fill, and lacustrine deposits. There is dune sand around the edges of the lake beds, or playas, and on alluvial fans at the northern end of the valley.

Geomorphology. This subsection is on predominantly nearly level lake plain and basin floor and gently to moderately sloping alluvial fans. The valley is oriented toward the north-northwest. Elevation range is about 1000 to 5000 feet. Fluvial erosion and deposition, and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic subgroups of Torriorthents, Torripsamments, Calciorthids, and Haplargids on alluvial fans; Typic Torrifluvents and Typic Torriorthents in basin-fill; and Typic Salorthids on



Subsection 322Ae, view toward Panamint Valley from Telescope Peak (341Ff) — *Robert Ettner* lacustrine deposits. Much of the lake plain is playa that lacks vascular plant cover. There are Typic Torripsamments on dune sand, but much of it is barren, lacking plant cover. The soils are well drained, except for poorly drained playas. The soil temperature regimes are thermic. Soil moisture regimes are aridic.

Potential Natural Vegetation. The predominant natural plant communities are Creosote bush series low on fans and Shadscale series high on fans. Mixed saltbush series is common on basin floor and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits. Greasewood series occurs in riparian areas and around saltmarsh. Much of the dry lake plain is devoid of vascular plants.

> **Characteristic series by lifeform include:**
> *Grasslands:* Alkali sacaton series, Desert sand - verbena series, Indian ricegrass series, Pickleweed series, Saltgrass series.
>
> *Shrublands:* Brittlebrush series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Iodine bush series, Mixed saltbush series, Scadscale series, White bursage series.
>
> *Forests and woodlands:* Mesquite series.

Climate. The mean annual precipitation is about 4 to 6 inches. It is mostly rain. Mean annual temperature is about 52° to 72° F. The mean freeze-free period is from 200 to 300 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin-fill. Drainage is internal, there is no outlet for surface water. A large area south of Panamint Valley drains into the valley. Streams are dry most of each year. There is temporary ponding on playas, or dry lake beds.

Subsection 322Af Searles Valley - Owlshead Mountains

This subsection includes the Slate Range, El Paso Mountains, Quail Mountains, Owlshead Mountains, southern ends of the Argus and Panamint Ranges, Searles Valley, Long Valley, and the southern end of Panamint Valley. It has a hot, arid climate. MLRA 30g.

Lithology and Stratigraphy. This subsection consists of about half upland and half alluvial plain. The upland is mainly Pre-Cenozoic granitic and metamorphic rocks, largely Mesozoic granitic rocks; Tertiary and Quaternary volcanic rocks; and Paleozoic marine and Paleocene nonmarine sedimentary rocks. The alluvial plain is Pliocene and Quaternary nonmarine sediments, mostly alluvial fan deposits; late Quaternary alluvial fan and basin-fill deposits; and late Quaternary lacustrine deposits, including salt.

Geomorphology. This section is on steep to very steep mountains and valleys with very gently to moderately sloping alluvial fans and nearly level basin floor and dry lake bed. The Argus, Slate, and Panamint Ranges are oriented north-south, or toward the north-northwest; the El Paso Mountains, Spangler Hills, Straw Peak in the Slate Range, and Quail Mountains are oriented east-west, parallel to the Garlock Fault; and the Owlshead Mountains are arranged in a semi-circular pattern that is attenuated by the Garlock Fault. The elevation range is from about 1200 feet in Long Valley up to 5578 feet on Straw Peak in the Slate Range. There are many peaks higher than 5000 feet above sea-level. Mass wasting, fluvial erosion and deposition, and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Lithic Torriorthents and Lithic Haplocambids on granitic and Pre-Cenozoic metamorphic rocks; Lithic Torriorthents and Lithic Haplargids on volcanic and sedimentary rocks; Typic Torriorthents, Typic Haplocalcids, and "badlands" on alluvial fans; and Typic Torrifluvents and Typic Torripsamments on basin floor. The soils are well drained, except on poorly drained playas. There are Salids on poorly drained playas lacking vascular plants. Soil temperature regimes are thermic; and soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush series on fans and lower mountain slopes and Shadscale series on higher mountain slopes. Also, there is some Black bush series on high mountain slopes. Mixed saltbush series is common on basin floor and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits. Greasewood series occurs in riparian areas and around saltmarsh.

> **Characteristic series by lifeform include:**
> *Grasslands:* Alkali sacaton series, Big galleta series, Indian ricegrass series, Saltgrass series.
>
> *Shrublands:* Black bush series, Brittlebrush series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Hop-sage series, Iodine bush series, Mixed saltbush series, Scadscale series, White bursage series.
>
> *Forests and woodlands:* Mesquite series.

Climate. The mean annual precipitation is about 4 to 10 inches. It is all rain in the valleys, but some snow at higher elevations. Mean annual temperature is about 50° to 70° F. The mean freeze-free period is about 200 to 300 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. The water drains to Searles Valley on the west, to Panamint Valley through the middle of the subsection, and through Long Valley to Death Valley on the east. Streams are dry most of each year. There is temporary ponding on playas, or dry lake beds.

Subsection 322Ag
High Desert Plains and Hills

This subsection consists of the western Mojave Desert, which is mostly alluvial plain and pediment, with relatively small areas of hills and low mountains. It includes Indian Wells Valley north of the Garlock Fault; otherwise it is between the Garlock Fault on the north and northwest, the San Andreas Fault on the southwest, the Mojave River on the southeast, and about the Harper Valley Fault on the northeast. It has a hot, arid climate. MLRAs 29f and 30g.

Lithology and Stratigraphy. This subsection contains mainly Mesozoic granitic rocks and Quaternary alluvium and lacustrine deposits. Eolian sand deposits are common. There are small areas of Precambrian gneiss and schist and Miocene and Pliocene nonmarine sedimentary rocks. There is a large Quaternary basalt flow in the northwestern part of Indian Wells Valley.

Geomorphology. This subsection is on mostly very gently to moderately sloping pediments and alluvial fans and nearly level basin floor and dry lake bed. There are a few moderately steep hills and steep mountains. Pediments are quite extensive. Some of the larger dry lake beds are China Lake in Indian Wells Valley, Koehn Lake in Fremont Valley, Cuddleback Lake, Harper Lake, Rodgers Dry Lake, Rosamond Lake, and El Mirage Lake. The elevation range is mostly from about 2000 to 3000 feet, but up to about 4000 feet adjacent to the Tehachapi Mountains and 4584 feet on Fremont Peak. Fluvial erosion and deposition and eolian deflation and deposition are the main geomorphic processes.

Subsection 322Ag, Indian Wells area — *James R. Nelson*

Soils. The soils are mostly shallow Typic Torriorthents, Lithic Haplocambids, Typic Haplargids, shallow Typic Haplodurids, and Typic Torripsamments on granitic hills and pediments; Typic Torrifluvents, Typic Torripsamments, Typic Torriorthents, Typic Haplargids, and Typic Argidurids on alluvial fans; and Typic Torrifluvents and Typic Torripsamments on basin floor. Soils on the rocky basalt flow in Indian Wells Valley are mainly Lithic Torriorthents. The soils are well drained, except on poorly drained playas. Salids occur on poorly drained playas lacking vascular plants. Soil temperature regimes are thermic; and soil moisture regimes are aridic.

Vegetation. The predominant natural plant community is Creosote bush series on hills, pediments, and fans. Joshua tree series is common on pediments and fans. California juniper series predominates above about 3000 feet near the San Andreas Fault. Mixed saltbush series is common on basin floor and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits. Greasewood series occurs in riparian areas and around saltmarsh.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, Big galleta series, Desert needlegrass series, Desert sand - verbena series, Indian ricegrass series, Saltgrass series.
Shrublands: Allscale series, Birchleaf mountain-mahogany - California buckwheat series, Brittlebrush series, California buckwheat series, Chamise series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Hop-sage series, Iodine bush series, Joshua tree series, Mixed saltbush series, Mojave yucca series, Rubber rabbitbrush series, Scalebroom series, Scadscale series, Spinescale series, White bursage series, Winter fat series.
Forests and woodlands: California juniper series, California sycamore series, Mesquite series.

Climate. The mean annual precipitation is about 4 to 10 inches. It is mostly rain. Mean annual temperature is about 60° to 66° F. The mean freeze-free period is about 250 to 275 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. All drainage is internal, to closed basins in the Mojave Desert. Streams are dry most of each year. There is temporary ponding on playas, or dry lake beds.

Subsection 322Ah Mojave Valley - Granite Mountains

This subsection consists of about half upland, including pediments, and half alluvial plain. There are many small mountain ranges and hills with many different orientation patterns. The subsection is bounded by the Garlock Fault Zone on the north, Avawatz Mountains on the northeast, Silurian Valley (outside of this subsection) on the east, the Soda Mountains on the southeast, Mojave Valley on the south, Harper Valley Fault on the southwest, and Rand Mountains on the west. It has a hot, arid climate. MLRA 30g.

Lithology and Stratigraphy. This subsection contains mainly Mesozoic plutonic rocks, Tertiary volcanic rocks, and Quaternary alluvium. Lacustrine and eolian sand deposits are common. The Mesozoic plutonic rocks are mostly granitic, but include some mafic rocks. There are areas of Quaternary volcanic, Tertiary nonmarine sedimentary, Pre-Cretaceous metamorphic, Paleozoic marine sedimentary, and Precambrian metamorphic rocks, too.

Geomorphology. This subsection is largely on very gently to moderately sloping pediments and alluvial fans and nearly level basin floor and dry lake bed. Less than half of the subsection is on steep mountains and moderately steep hills. Some of the dry lake beds are Bicycle, Coyote, East Cronese, West Cronese, Goldstone, Langford Wells, Leach, Manix, Nelson, Pilot Knob Valley, Red Pass, and Superior Lakes. The elevation range is from about 1080 feet on Cronese Lakes to about 5600 feet in the Avawatz Mountains. Mass wasting, fluvial erosion and deposition, and eolian deflation and deposition are the main geomorphic processes.

Soils. The upland soils are mostly shallow Typic Torriorthents on granitic rocks and Typic Haplargids on volcanic rocks. Also, there are "badlands" on Miocene marine sedimentary rocks. Soil on floodplains and on younger fans are Typic subgroups of Torrifluvents, Torripsamments, and Torriorthents. Those on older fans are Typic Torriorthents, Typic Haplargids, and Durinodic Calciargids. Soil on basin floor and dune sand are Typic Torriorthents and Typic Torripsamments. The soils are well drained, except on poorly drained playas. Soil temperature regimes are thermic; and soil moisture regimes are aridic.

Vegetation. The predominant natural plant community is Creosote bush series on hills, pediments, and fans. Joshua tree series is common on pediments and fans. Black bush series occurs at higher elevations, particularly in the Avawatz Mountains. Mixed saltbush series is common on basin floor and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits. Greasewood series occurs in riparian areas and around saltmarsh. Catclaw acacia series is common along the Mojave River.

Characteristic series by lifeform include:

Grasslands: Alkali sacaton series, Big galleta series, Desert needlegrass series, Desert sand - verbena series, Indian ricegrass series, Saltgrass series.

Shrublands: Allscale series, Brittlebrush series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Hop-sage series, Iodine bush series, Joshua tree series, Mixed saltbush series, Mojave yucca series, Rubber rabbitbrush series, Scadscale series, Spinescale series, White bursage series, Winter fat series.

Forests and woodlands: Mesquite series.

Climate. The mean annual precipitation is about 4 to 6 inches. It is mostly rain. Mean annual temperature is about 55° to 70° F. The mean freeze-free period is about 200 to 300 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. All drainage is internal, to closed basins in the Mojave Desert. The Mojave River, the only large stream in the western Mojave Desert, drains toward Cronese Valley, or toward Soda Lake. During the Pleistocene it drained through Silurian Valley to Death Valley. Streams are dry most of each year, and most of the water in the Mojave River drains beneath the river bed, surfacing only where there are bedrock constrictions, such as in Afton Canyon. There is temporary ponding on playas, or dry lake beds.

Subsection 322Ai Silurian Valley - Devil's Playground

This subsection includes the alluvial plain of the Silurian Valley, from where the Amargosa River enters it on the north to where the Mojave River enters it on the south,

Subsection 322Ai, near Baker — *Charles B. Goudey* and the Devil's Playground just southeast of Silurian Valley and up Kelso Wash toward Ivanpah Valley. There are a few hills protruding through the alluvial plain. It has a very hot, arid climate. MLRA 30g.

Lithology and Stratigraphy. This subsection contains mainly Quaternary fluvial, lacustrine, and eolian sand deposits. Hills protruding through the alluvial plain are mostly Mesozoic granitic, Paleozoic marine, and Precambrian metamorphic rocks.

Geomorphology. This subsection is mainly on very gently to moderately sloping alluvial fans, nearly level basin floor and dry lake bed, and sloping to steep sand dunes. There are large playas on Soda Lake, Silver Lake, and Silurian Lake. The elevation range is about 300 to 1200 feet on alluvial plains and up to about 2400 feet on the highest hill. Fluvial erosion and deposition and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic subgroups of Torrifluvents, Torripsamments, and Torriorthents on younger fans and basin-fill and Typic subgroups of Torriorthents, Calciorthids, Camborthids, and Haplargids on older fans. Soils on hills are mostly Lithic Torriorthents, plus Lithic Camborthids on granitic rocks. Soils on dune sand are Typic Torripsamments. The soils are well drained, except on poorly drained playas. Soil temperature regimes are hyperthermic; and soil moisture regimes are aridic.

Vegetation. The predominant natural plant community is Creosote bush series on hills and fans. Mixed saltbush series is common on basin floor and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits. The Desert sand-verbena series is common on stabilized dunes.

> **Characteristic series by lifeform include:**
> *Grasslands*: Alkali sacaton series, Big galleta series, Desert sand-verbena series, Indian ricegrass series, Saltgrass series.
>
> *Shrublands*: Brittlebrush series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Iodine bush series, Joshua tree series, Mixed saltbush series, Scadscale series, White bursage series, Winter fat series.
>
> *Forests and woodlands*: Mesquite series.

Climate. The mean annual precipitation is about 4 to 6 inches. It is mostly rain. Mean annual temperature is about 70° to 75° F. The mean freeze-free period is about 300 to 325 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. All drainage is internal, to closed basins in Silurian Valley or in Death Valley. Some water from the Mojave River, reaches Soda Lake in wet years, even though it might not flow overland (above-ground). During the Pleistocene the Mojave and Amargosa Rivers drained through Silurian Valley to Death Valley. Streams are dry most of each year. There is temporary ponding on playas, or dry lake beds.

Subsection 322Aj Kingston Range - Valley Wells

This subsection includes mountains, hills, pediments, and high alluvial plains between Silurian Valley and Devil's Playground on the west and southwest, California Valley on the northwest, Pahrump Valley on the north, Mesquite Valley and Ivanpah Fault on the northeast, and Ivanpah Valley on the southeast, plus the southern part of the Spring Mountains. The subsection is on about half upland and half alluvial plain. It has a hot, arid climate that is moderated by elevation on the higher mountains. MLRAs 29f and 30g.

Lithology and Stratigraphy. The upland in this subsection contains mainly Mesozoic granitic, Quaternary volcanic, Paleozoic marine sedimentary, and Precambrian sedimentary and metamorphic rocks. There are Pleistocene and recent basalt flows along the ridge on the east side of Shadow Valley. The alluvial plain is mostly fluvial deposits, with a small area of lacustrine deposits at Valley Wells in Shadow Valley.

Geomorphology. This subsection is on steep to very steep mountains, gently to moderately sloping pediments and alluvial fans, and nearly level basin floor. Some of the pediments are capped by Quaternary lava flows, and there are many volcanic cones on the flows. The mountains and ridges are oriented north-south or toward the north-northwest. The elevation range is about 1000 to 4000 feet on alluvial plains and up to 7324 feet in the Kingston Range and 7929 feet on Clark Mountain. Mass wasting, fluvial erosion and deposition, and volcanism are the main geomorphic processes.

Soils. The upland soils are mostly Lithic Torriorthents, plus Lithic Camborthids on granitic rocks and Lithic

Subsection 322Aj, near Holloran Springs — *Charles B. Goudey*

Haplargids on volcanic rocks. At higher elevations, the upland soils are Lithic Xeric Torriorthents, shallow Xeric Torriorthents, and shallow Xeric Haplargids; shallow Aridic Argixerolls are less common. Soils on alluvial plains are mostly Typic Torriorthents and Typic Torripsamments on younger fans and Typic Calciorthids and Typic Haplargids on older fans. The soils are well drained. Soil temperature regimes are mostly thermic, and mesic at higher elevations. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush series on fans, Shadscale series on lower mountain slopes, Singleleaf pinyon series on higher mountain slopes, and White fir series on the highest mountains. Joshua tree series is common on alluvial plains. Black bush series occurs on mountain slopes.

Characteristic series by lifeform include:

Grasslands: Alkali sacaton series, Big galleta series, Indian ricegrass series, Saltgrass series.

Shrublands: Big sagebrush series, Bitterbrush series, Black bush series, Black sagebrush series, Brittlebrush series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Hop-sage series, Iodine bush series, Joshua tree series, Mixed saltbush series, Nolina series, Scadscale series, White bursage series.

Forests and woodlands: Mesquite series, Singleleaf pinyon series, Singleleaf pinyon - Utah juniper series, Utah juniper series, White fir series.

Climate. The mean annual precipitation is about 5 to 8 inches. It is mostly rain, but snow at higher elevations. Mean annual temperature is about 45° to 72° F. The mean freeze-free period is about 150 to 300 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. Most of the runoff drains to closed basin around the subsection. Runoff from Valley Wells is through Kingston Wash to Silurian Valley. Streams are dry most of each year; water flows in few of them except following intense rain. There is temporary ponding on playas, or dry lake beds.

Subsection 322Ak Ivanpah Valley

This subsection is the alluvial plain of Ivanpah Valley. There are a few moderately steep hills protruding through the alluvial plain. It has a hot arid climate. MLRA 30g.

Subsection 322Ak, Ivanpah Valley area near Nipton — *Charles B. Goudey*

Lithology and Stratigraphy. This subsection contains mainly Quaternary fluvial, lacustrine, and eolian sand deposits. Hills protruding through the alluvial plain are mainly Precambrian metamorphic rocks.

Geomorphology. This subsection is mainly on very gently to moderately sloping alluvial fans, nearly level basin floor and dry lake bed. Ivanpah Valley is oriented toward the north-northeast. Alluvial fans slope up to about 18%, but only the upper parts of them have slopes > 12 or 15%. There are large playas on the lake beds. The elevation range is about 2600 to 4500 feet. Fluvial erosion and deposition, and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic subgroups of Torrifluvents, Torripsamments, and Torriorthents and Calciorthids. There are shallow Typic Paleorthids on old fans. Soils on hills are mostly Lithic Torriorthents and Lithic Camborthids. The soils are well drained, except on poorly drained playas. Soil temperature regimes are thermic; and soil moisture regimes are aridic.

Vegetation. The predominant natural plant community is Creosote bush series. Joshua tree series is common on alluvial plains. Mixed saltbush series is common on basin floor and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits. Greasewood series occurs in riparian areas and around saltmarsh.

Characteristic series by lifeform include:

Grasslands: Alkali sacaton series, Big galleta series, Desert sand - verbena series, Indian ricegrass series, Saltgrass series.

Shrublands: Brittlebrush series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Iodine bush series, Joshua tree series, Mixed saltbush series, Scadscale series, White bursage series, Winter fat series.

Forests and woodlands: Mesquite series.

Climate. The mean annual precipitation is about 4 to 7 inches. It is mostly rain. Mean annual temperature is about 50° to 64° F. The mean freeze-free period is about 200 to 250 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. All drainage is internal, mostly to closed basins in Ivanpah Valley, but the southern end drains through Kelso Wash to Silurian Valley. Streams are dry most of each year. There is temporary ponding on playas, or dry lake beds.

Subsection 322Al Providence Mountains - Lanfair Valley

This subsection includes Lanfair Valley, the mountains surrounding it, the upper part of Fenner Valley, the mountains on the east and west sides of Fenner Valley, Granite Mountain, and Bristol Mountain. The subsection is about half upland and half alluvial plain. It has a hot arid climate that is moderated by elevation on the higher mountains. MLRAs 29f and 30g.

Lithology and Stratigraphy. The uplands in this subsection are mainly Mesozoic granitic, Tertiary volcanic, Paleozoic marine sedimentary, Pre-Cretaceous granitic and metamorphic, and Precambrian metamorphic rocks. The alluvial plains are mostly Quaternary fluvial deposits, but some Pliocene and possibly earlier Tertiary deposits. There is a small area of lacustrine deposits on the east side of Lanfair Valley.

Geomorphology. This subsection is on steep to very steep mountains, gently to moderately sloping pediments and alluvial fans, and nearly level basin floor. The mountains and ridges are oriented north-south or toward the north-northwest, except Granite Mountain and mountains southwest of Granite Mountain. Mountains on the east and west sides of Fenner and Lanfair Valleys converge at the north end of Lanfair Valley. Lanfair and Fenner Valleys are separated by Hackberry Mountain and hills in an east-west row. Bristol, Old Dad, and Marble Mountains southwest of Granite Mountains have a northwest trend. Granite Mountains have a transitional trend, between this northwest trend and the north-northeast trend of Providence Mountains. The elevation range is from about 1000 feet in Fenner Valley up to 5340 feet in the Old Woman Mountains, 6790 feet in the Granite Mountains, 6608 feet in the Providence Mountains, and 7540 feet in the New York Mountains. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The upland soils are mostly Lithic Torriorthents and Lithic Camborthids, plus Lithic Haplargids on volcanic rocks. At higher elevations, the upland soils are Lithic Xeric Torriorthents, shallow Xeric Torriorthents, and shallow Xeric Haplargids. Soils on alluvial plains are mostly Typic Torriorthents and Typic Torripsamments on younger fans and Typic Camborthids and Typic Haplargids on older noncarbonatic and Typic Calciorthids and shallow Typic Paleorthids on older carbonatic fans. The soils are well drained. The soil temperature regimes are mostly thermic, but mesic at higher elevations. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush series on fans and lower mountain slopes, Singleleaf pinyon series on higher mountain slopes, and White fir series on the highest mountains. Joshua tree series is common on alluvial plains. Black bush series occurs on mountain slopes.

> **Characteristic series by lifeform include:**
> *Grasslands*: Alkali sacaton series, Big galleta series, Indian ricegrass series, Saltgrass series.
>
> *Shrublands*: Big sagebrush series, Bitterbrush series, Black bush series, Black sagebrush series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Hop-sage series, Iodine bush series, Joshua tree series, Mixed saltbush series, Mojave yucca series, Nolina series, Scalebroom series, Scadscale series, Teddy-bear cholla series, White bursage series.
>
> *Forests and woodlands*: Mesquite series, Singleleaf pinyon series, Singleleaf pinyon - Utah juniper series, Twoleaf pinyon stands, Utah juniper series, White fir series.

Climate. The mean annual precipitation is about 4 to 10 inches. It is mostly rain, but snow at higher elevations. Mean annual temperature is about 45° to 72° F. The mean freeze-free period is about 175 to 300 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. Most of the runoff drains to closed basin around the subsection. Some runoff from Lanfair Valley and upper Fenner Valley is through the Piute Mountains to Piute Valley on the east, but more is south through Fenner Valley to Cadiz Valley. Streams are dry most of each year; water flows in few of them except following intense rain.

Subsection 322Am Piute Valley - Sacramento Mountains

This subsection includes Piute Valley, Dead Mountains, upper part of Ward Valley, Sacramento Mountains, Chemehuevi Valley, Whipple Mountains, and Turtle Mountains. The subsection is about half upland and half alluvial plain. It has a hot to very hot arid climate that is moderated by elevation on the higher mountains. MLRAs 29f and 30g.

Lithology and Stratigraphy. The uplands in this subsection are mainly Mesozoic granitic, Tertiary volcanic, and Precambrian granitic and metamorphic rocks. The alluvial plains are mostly Quaternary fluvial deposits, but some Pliocene and possibly earlier nonmarine Tertiary deposits. There are small areas of lacustrine deposits.

Geomorphology. This subsection is on steep to very steep mountains, gently to moderately sloping pediments and alluvial fans, and nearly level basin floor. Tertiary sediments are generally eroded to "badlands". Dead Mountain, Piute Valley, and Ward Valley are aligned north-south. Sacramento Mountains and Turtle Mountains are oriented toward the northwest, but the Turtle Mountains are turned toward the north at the northern end, parallel to Ward Valley. Whipple Mountains and Chemehuevi Valley arc from a east-northeast trend around to a northwest trend parallel to and between the Turtle and Sacramento Mountains. The elevation range is from 450 feet along the Colorado River to about 3000 feet in the Sacramento Mountains, about 4000 feet in the Whipple Mountains, and up to 5866 feet on Horn Peak in the Turtle Mountains. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The upland soils are mostly Lithic Torriorthents and Lithic Camborthids, plus Lithic Haplargids on volcanic rocks. Soils on alluvial plains are mostly Typic Torriorthents and Typic Torripsamments on younger fans and Typic Camborthids and shallow Typic Paleorthids on older fans. The soils are well drained. Soil temperature regimes are thermic in mountains and hyperthermic on most of the alluvial plains, except in Piute Valley. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush series and Creosote bush - white bursage series. Black bush series occurs on higher mountain slopes. Current plant communities include Tamarisk series in riparian areas along the Colorado River.

> **Characteristic series by lifeform include:**
>
> *Grasslands*: Big galleta series, Indian ricegrass series.
>
> *Shrublands*: Black bush series, Brittlebrush series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Scadscale series, Tamarisk series, Teddybear cholla series, White bursage series.

Climate. The mean annual precipitation is about 5 to 10 inches. It is all rain at lower elevations and mostly rain at higher elevations. Mean annual temperature is about 50° to 74° F. The mean freeze-free period is about 200 to 300 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. Most of the runoff drains through Piute Wash, Chemehuevi Valley, or Vidal Valley to the Colorado River, but some drains through Ward Valley to Danby Lake. Streams are dry most of each year; water flows in few of them except following intense rain.

Subsection 322An Lucerne - Johnson Valleys and Hills

This subsection includes mountains, hills, pediments and alluvial plain north of the San Bernardino and Bighorn Mountains and the Pinto Mountain Fault, from the Mojave River east to the linear depression (subsection 322Ao) that stretches from Troy Lake southeastward to Cadiz Lake and beyond. The area of pediment and alluvial plain is greater than that of mountains and hills. It has a hot, arid climate. MLRAs 29f and 30g.

Lithology and Stratigraphy. The bedrock in this subsection is mainly Mesozoic granitic rocks, compared to mostly volcanic rocks to the east. Also, there is Jurassic - Triassic metavolcanic and Precambrian metamorphic rock and some Mesozoic mafic plutonic and Paleozoic marine sedimentary rock. Transported Quaternary deposits are mostly alluvium, but include lacustrine deposits and eolian sand.

Geomorphology. This section is on steep mountains, moderately steep hills, very gently to moderately sloping pediments and alluvial fans, and nearly level basin floor and dry lake bed. There are "badlands" on eroded Miocene nonmarine sedimentary rocks. The general orientation of the hills is not nearly as clear as that of the major faults, which trend northwest. Some of the larger dry lake beds are, from west to east, Lucerne, Soggy, Melville, Galway, Emerson, and Deadman Lake. The elevation range is from about 1600 feet up to 4873 feet in the Granite Mountains, 5525 feet in the West Ord and 6309 feet in the East Ord Mountains, and 5878 feet in the Rodman Mountains. Mass wasting, fluvial erosion and deposition, and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Lithic Torriorthents and Lithic Haplocambids in uplands, and some shallow Xeric Torriorthents and shallow Xeric Haplargids in areas with mesic soil temperature regimes. Typic Haplargids are common on volcanic rocks and on north-facing slopes in granitic terrain. Soils on younger fans and basin-fill are mostly Typic Torrifluvents, Typic Torripsamments, and Typic Torriorthents. Soils on older fans are mostly Durinodic Haplocalcids and Durinodic Calciargids. The soils are well drained, except on poorly drained playas. There are Salorthids on poorly drained

Subsection 322An, near Twenty Nine Palms — *John C. Rule*

playas lacking vascular plants. Soil temperature regimes are mostly thermic, and mesic on the higher mountains. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant community is Creosote bush series, and Big galleta series is common. Joshua tree series is common on pediments and fans and Indian ricegrass series occurs on eolian sand. California juniper series predominates above about 3000 feet near the San Andreas Fault. Black bush series occurs on the higher mountains. Mixed saltbush series is common on basin floor and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits.

Characteristic series by lifeform include:

Grasslands: Alkali sacaton series, Big galleta series, Desert needlegrass series, Desert sand - verbena series, Indian ricegrass series, Saltgrass series.

Shrublands: Allscale series, Black bush series, Brittlebrush series, California buckwheat series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Hop-sage series, Iodine bush series, Joshua tree series, Mixed saltbush series, Mojave yucca series, Rubber rabbitbrush series, Scalebroom series, Scadscale series, Spinescale series, White bursage series, Winter fat series.

Forests and woodlands: California juniper series, California sycamore series, Mesquite series.

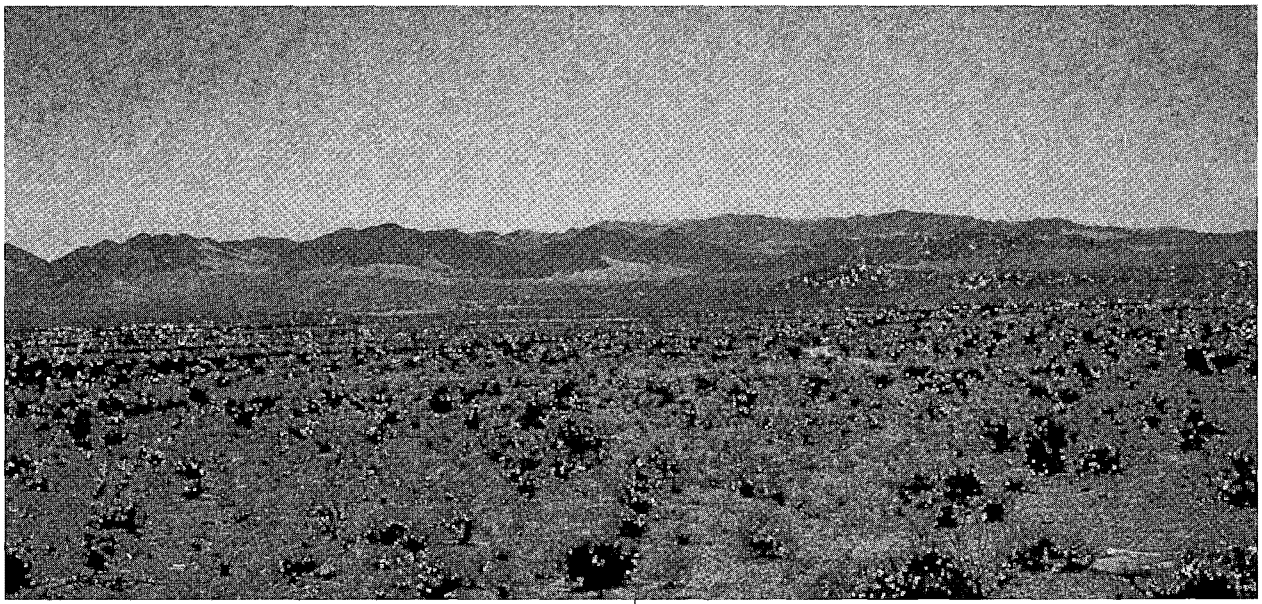
Climate. The mean annual precipitation is about 4 to 8 inches. It is mostly rain. Mean annual temperature is about 50° to 68° F. The mean freeze-free period is about 200 to 275 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. All drainage is internal, to closed basins in the Mojave Desert. Streams are dry most of each year. There is temporary ponding on playas, or dry lake beds.

Subsection 322Ao
Bullion Mountains - Bristol Lake

This subsection includes alluvial fans, basin floor, volcanic flows, and mountains and hills in a linear depression that stretches from Troy Lake southeastward to Bristol Lake and beyond, plus the lower part of Fenner Valley. It has a very hot arid climate. MLRAs 30g and 30h.

Lithology and Stratigraphy. Quaternary alluvial, lacustrine, and eolian deposits and Cenozoic volcanic rocks predominate in this subsection. The volcanic rocks are mostly Miocene andesite and basalt and



Subsection 322Ao, looking south from Mannix area.
322Ah in foreground — *Charles B. Goudey*

Quaternary basalt. The mountains are mostly Mesozoic granitic and Pre-Cenozoic metamorphic rocks.

Geomorphology. This subsection is on very gently to moderately sloping alluvial fans and volcanic flows, nearly level basin floor and dry lake bed, steep mountains, and moderately steep hills. Fenner Valley is aligned toward the northeast. The Sheep Hole and Calumet Mountains south of Bristol Lake and Bullion Mountains (subsection 322An) are aligned toward the northwest to north-northwest and the Ship Mountains in Fenner Valley are oriented toward the north-northeast. Bristol Lake is the largest dry lake bed; others are Troy, Broadwell, Lavic, and Dale Lakes. Two prominent craters on recent basalt flows are Pisgah Crater in the northwest part of the subsection and Amboy Crater on a flow over Bristol Lake. The elevation range is from about 620 feet on Bristol Lake up to 3726 feet in the Calumet Mountains, 4685 feet in the Sheep Hole Mountains, and 3300 feet in the Ship Mountains. Fluvial erosion and deposition, eolian deflation and deposition, and mass wasting are the main geomorphic processes.

Soils. The soils are mostly Lithic Torriorthents and Lithic Haplocambids on mountains and the rocky recent basalt flows, plus Lithic Haplargids on older volcanic flows and on north-facing slopes in granitic terrain. The soils are mostly Typic Torrifluvents, Typic Torripsamments, and Typic Torriorthents on younger fans and Durinodic Haplocalcids and Durinodic Calciargids on older fans. Typic Torripsamments and Arenic Haplargids occur in eolian sand. The soils are well drained, except on poorly drained playas. There are Salorthids on poorly drained playas lacking vascular plants. Soil temperature regimes are mostly thermic on the mountains and hyperthermic on large basin floors and on south-facing slopes at lower elevations. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush series and Creosote bush - white bursage series. Mixed saltbush series is common on basin floor and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits.

> **Characteristic series by lifeform include:**
> *Grasslands*: Alkali sacaton series, Big galleta series, Desert sand - verbena series, Indian ricegrass series, Saltgrass series.
> *Shrublands*: Brittlebrush series, Bush seepweed series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbrush series, Greasewood series, Iodine bush series, Joshua tree series, Mixed saltbush series, Scadscale series, White bursage series, Winter fat series.
> *Forests and woodlands*: Blue palo verde - ironwood - smoke tree series, Mesquite series.

Climate. The mean annual precipitation is about 3 to 5 inches. It is all rain. Mean annual temperature is about 56° to 74° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. All drainage is internal, to closed basins in the subsection. Streams are dry most of each year; they may have no water in them some years. There is temporary ponding on playas, or dry lake beds.

Subsection 322Ap
Pinto Basin and Mountains

This subsection consists of steep mountains and broad valleys west of the northwest trending Little San Bernardino Mountains. It includes the Pinto Basin, Pleasant Valley, and the Pinto, Coxcomb, Eagle, Hexie, and Cottonwood Mountains. It has a hot to very hot, arid climate. MLRA 30g.

Lithology and Stratigraphy. The bedrock in this subsection is mainly Mesozoic granitic, Pre-Cretaceous metasedimentary, and Precambrian metamorphic rocks. Alluvium and basin-fill predominate in the valleys; lacustrine deposits are not extensive.

Geomorphology. This subsection is on steep mountains, moderately steep hills; very gently to moderately sloping pediments and alluvial fans; and nearly level basin floor. Dry lake bed and dune sand are not extensive. The general orientation of the hills is not clear, except the north-south aligned Coxcomb Mountains on the eastern edge of the subsection and the Pinto Mountains which are along the east-west Pinto Mountain Fault that is the northern boundary of the subsection. The Pinto basin and southern edge of the subsection along Shaver Valley are aligned east-west. The elevation range is from about 1000 feet up to 5350 feet in the Eagle Mountains, 4834 feet on Monument Mountain, and 5687 feet on Queen Mountain. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Lithic Torriorthents and Lithic Camborthids on uplands. Soils on younger fans and basin-fill are mostly Typic Torrifluvents, Typic Torripsamments, and Typic Torriorthents. The soils on older fans are mostly Typic Calciorthids and Typic Haplargids. Soil temperature regimes are mostly thermic on mountains and hyperthermic in valleys. Soil moisture regimes are aridic.

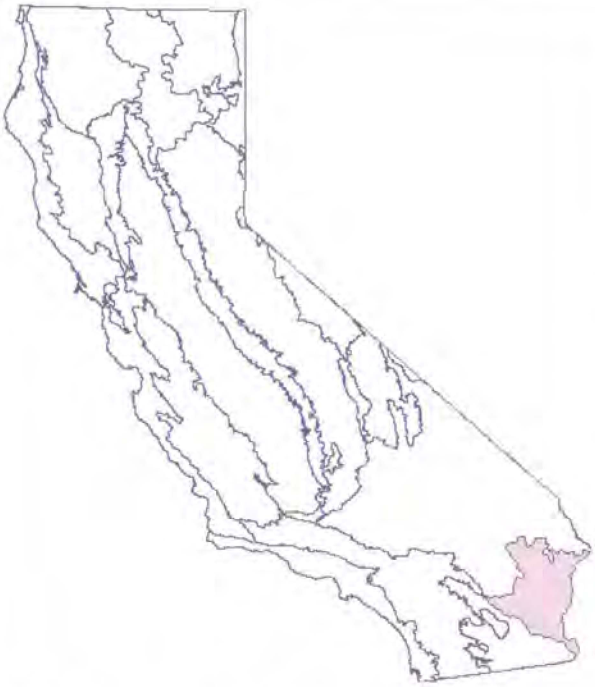
Vegetation. The predominant natural plant communities are Creosote bush series and Creosote bush - white bursage series. California juniper series is common on higher mountains and Joshua tree series is common on pediments and fans. Fan palm series occurs in riparian areas near the southern edge of the subsection.

> **Characteristic series by lifeform include:**
>
> *Grasslands*: Big galleta series, Desert needlegrass series, Indian ricegrass series.
>
> *Shrublands*: Birchleaf mountain-mahogany - California buckwheat series, Brittlebush series, California buckwheat series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Joshua tree series, Mojave yucca series, Nolina series, Rubber rabbitbrush series, Teddybear cholla series, White bursage series.
>
> *Forests and woodlands*: Blue palo verde - ironwood - smoke tree series, California juniper series, Fan palm series, Mesquite series, Singleleaf pinyon series

Climate. The mean annual precipitation is about 4 to 8 inches. It is practically all rain. Mean annual temperature is about 50° to 72° F. The mean freeze-free period is about 200 to 300 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. Runoff from Pinto Basin and most of the mountains is to Chuckawalla Valley. Streams are dry most of each year. There is temporary ponding on playas, or dry lake beds.

CHAPTER 15



Section 322B
Sonoran Desert

This section is the hot part of the Basin and Range Province, from the eastern end of the Transverse Ranges and the Salton Trough east to Arizona. Some rain falls during the summer. The section is in MLRA 30.

Geomorphology. Widely separated short ranges in desert plains. Basin and Range geomorphic province.

Lithology. Cenozoic sedimentary rocks and alluvial eolian deposits, and Precambrian to Cenozoic granitic and metamorphic rocks.

Soil Taxa. Aridisols and Entisols in combination with thermic or hyperthermic soil temperature regimes and aridic soil moisture regimes.

Vegetation. Predominant potential natural communities includes the Creosote bush series, Creosote bush - white bursage series, Mixed salt bush series, Blue palo verde - ironwood - smoke tree series, Mesquite series, Ocotillo series and Foothill paloverde - saguaro series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Gaint reed series and Tamarisk series.
>
> *Series that can occur in all subsections, but are not extensive*: Bulrush series, Bulrush - cattail series, Cattail series, Duckweed series, Mosquito fern series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Saltgrass series, Sedge series and Spikerush series.
>
> *Series restricted to riparian settings*: Arrow weed series, Black willow series, Fremont cottonwood series, Mixed willow series, Mulefat series, Narrowleaf willow series and Red willow series.

Fauna. Reserved.

Elevation. 250 to 4400 feet.

Precipitation. 3 to 6 inches. Occurs as winter rain and high intensity summer thunderstorms.

Temperature. 60° to 75°F.

Growing Season. 250 to 325 days

Surface Water Characteristics. Mostly bedrock controlled channels in mountains that carry seasonal flows to alluvial channels below. Channels terminate in basins or the Colorado River.

Disturbance Regimes.
Climate: Flash floods are commonly associated with summer precipitation events.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the late 1800's and early 1900's related to mining, agriculture and grazing. Since the early 1900's, significant effects on some plant and animal species occur at widely scattered locations associated with military installations, agriculture, recreational activities and expanding settlement.

Cultural Ecology. Humans have been utilizing the area for some 10,000 years, with early Paleoindian hunting assemblages documented at sites in the Mojave. After the end of the Pleistocene, Archaic assemblages reflect extensive practice of seasonal rounds for diversified hunting and gathering. Agricultural practices of Colorado River cultures spread through scattered areas during Late Prehistoric times, after A.D. 1000. Contemporary attitudes and beliefs are varied; lifestyle is rural. The economy emphasizes government employment, mining, ranching, and recreation.

Subsections. The Sonoran Desert section is divided into 5 subsections.

Subsection 322Ba
Cadiz - Vidal Valleys

This subsection includes mostly alluvial fans and basin floors in Cadiz, Palen, Rice, and Vidal Valleys and the lower part of Ward Valley. It includes Iron Mountain and hills that stick up through the alluvial plains in the valleys. The climate is very hot and arid climate. MLRA 30g.

Lithology and Stratigraphy. Quaternary alluvial, lacustrine, and eolian deposits predominate in this subsection. The mountains and hills are mostly Mesozoic granitic and Pre-Cenozoic and Precambrian granitic and metamorphic rocks.

Geomorphology. This subsection is on very gently to moderately sloping alluvial fans, nearly level basin floors and dry lake beds, steep mountains, and moderately steep hills. Palen and Ward Valleys are aligned north-south. The other Valleys are in a depression that extends from the south end of Silurian Valley southeast to the Colorado River. There are two large dry lake beds; Cadiz Lake in Cadiz Valley and Danby Lake in Ward Valley. The elevation ranges from about 400 to 1800 feet on alluvial plains up to 3350 feet in the Iron Mountains. Fluvial erosion and deposition and eolian deflation and deposition are the main geomorphic processes, plus mass wasting in the Iron Mountains.

Soils. The soils are mostly Lithic Torriorthents on mountains and hills. They are mostly Typic Torrifluvents, Typic Torripsamments, and Typic Torriorthents on younger fans and basin-fill and mostly Typic Calciorthids and Typic Haplargids on older fans. There are Typic Torripsamments in eolian sand. The soils are well drained, except on poorly drained playas. There are Salorthids on poorly drained playas lacking vascular plants. Soil temperature regimes are mostly hyperthermic, and thermic in the Iron Mountains. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush series and Creosote bush - white bursage series. Black bush series occurs at higher elevations in the Iron Mountains. Mixed saltbush series is common and Mesquite series occurs on basin floors.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, Desert sand - verbena series, Indian ricegrass series, Pickleweed series, Saltgrass series.

Shrublands: Allscale series, Black bush series, Bush seepweed series, Catclaw acacia series, Brittlebush series, Brittlebush - white bursage series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbush series, Iodine bush series, Mixed saltbush series, Ocotillo series, Teddy-bear cholla series, White bursage series.

Forests and woodlands: Blue palo verde - ironwood - smoke tree series, Foothill palo verde - saguaro series, Mesquite series.

Climate. The mean annual precipitation is about 3 to 5 inches. It is all rain. Mean annual temperature is about 65° to 75° F. The mean freeze-free period is about 275 to 325 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. The drainage from Palen and Cadiz Valleys is to Cadiz Lake, from Ward Valley it is to Danby Lake, and from Vidal and at least part of Rice Valley it is to the Colorado River. Streams have no water in some years and are dry most of each year in other years. There is temporary ponding on playas, or dry lake beds, in some years.

Subsection 322Bb
Palen - Riverside Mountains

This subsection includes six small mountain ranges, each surrounded by alluvial plain, that are close together. They are between Ward and Rice Valleys on the north, the Colorado River on the east, Chuckawalla and Palo Verde valleys on the south, and Palen valley on the west. The subsection has a hot to very hot arid climate. MLRA 30g.

Lithology and Stratigraphy. The bedrock in this subsection is mainly Mesozoic granitic, Pre-Cretaceous metavolcanic, Paleozoic marine sedimentary, and Precambrian igneous and metamorphic rocks.

Geomorphology. This subsection is on steep mountains. The mountain ranges are somewhat elongated, with trends ranging from north-south to northwest. The elevation ranges from about 400 feet adjacent to the Colorado River up to 2252 feet in the East Riverside and 2667 feet in the West Riverside Mountains, 2870 feet in the Big Maria Mountains, 2835 feet in the McCoy Mountains, 3043 in the Little Maria Mountains, 3623 feet in the Palen Mountains, and 4353 feet in the Granite Mountains. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Lithic Torriorthents and Lithic Camborthids. Soils on alluvial fans surrounding the mountains are mostly Typic subgroups of Torriorthents, Calciorthids, and Haplargids. Soil temperature regimes are mostly thermic, and some hyperthermic; and soil moisture regimes are aridic.

Vegetation. The predominant natural plant community is Creosote bush - white bursage series. Blue paloverde - ironwood - smoke tree series occurs in washes.

Characteristic series by lifeform include:
Grasslands: Big galleta series.

Shrublands: Brittlebush series, Brittlebush - white bursage series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Ocotillo series, Teddy-bear cholla series, White bursage series.

Forests and woodlands: Blue palo verde - ironwood - smoketree series.

Climate. The mean annual precipitation is about 3 to 5 inches. It is all rain. Mean annual temperature is about 60° to 75° F. The mean freeze-free period is about 250 to 300 days.

Surface Water. Runoff is rapid. Streams are dry most of each year, and dry throughout some years.

Subsection 322Bc
Chuckawalla Valley

This subsection includes the alluvial fans and basin floor in Chuckawalla Valley, between the Eagle Mountains on the north-northwest end and Palo Verde Valley on the east-southeast end. It has a very hot arid climate. MLRA 30g.

Lithology and Stratigraphy. Quaternary alluvial, lacustrine, and eolian deposits predominate in this subsection.

Geomorphology. This section is on very gently to moderately sloping alluvial fans, nearly level basin floors, and dry lake beds. The elevation ranges about 400 to 1800 feet. Fluvial erosion and deposition and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Torrifluvents, Torripsamments, Torriorthents and Haplocambids on younger fans and basin-fill, and mostly Haplocalcids, Petrocalcids, Haplargids, Argidurids, and shallow Haplodurids on older fans. There are Typic Torripsamments in eolian sand. The soils are well drained, except on poorly drained playas. There are Haplogypsids and Haplosalids on poorly drained playas lacking vascular plants. Soil temperature regimes are hyperthermic; and soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush series and Creosote bush - white bursage series. Mixed saltbush series is common and Mesquite series occurs on basin floors. Blue palo verde - ironwood - smoke tree series occurs in washes and on some sand dunes.

> **Characteristic series by lifeform include:**
> *Grasslands*: Alkali sacaton series, Desert sand - verbena series, Indian ricegrass series, Pickleweed series, Saltgrass series.
>
> *Shrublands*: Allscale series, Bush seepweed series, Brittlebush series, Brittlebush - white bursage series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbush series, Iodine bush series, Mixed saltbush series, Ocotillo series, Teddy-bear cholla series, White bursage series.
>
> *Forests and woodlands*: Blue palo verde - ironwood - smoke tree series, Mesquite series.

Climate. The mean annual precipitation is about 3 to 4 inches; it is all rain. Mean annual temperature is about 65° to 75° F. The mean freeze-free period is about 275 to 325 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. The drainage is internal, toward Palen Dry Lake or Ford Dry Lake, but runoff generally sinks below ground before reaching these dry lakes. Streams have no water in some years and are dry most of each year in other years. There is temporary ponding on playas, or dry lake beds, in some years.

Subsection 322Bd
Palo Verde Valley and Mesa

This subsection comprises the alluvial plain in McCoy Wash and Palo Verde Valley, which are between the McCoy Mountains, Chuckawalla Valley, Mule Mountains, and Palo Verde Mountains on the west and the Colorado River on the east. It has a very hot arid climate. MLRAs 30g and 31g.

Lithology and Stratigraphy. Quaternary alluvial deposits predominate in this subsection.

Geomorphology. This subsection is on very gently to moderately sloping alluvial fans and nearly level floodplain. The elevation ranges about 250 to 800 feet. Fluvial erosion and deposition and are the main geomorphic processes.

Soils. The soils are mostly Typic Torrifluvents, Typic Torripsamments, and Typic Torriorthents on younger fans and on floodplain of the Colorado River and mostly Typic Calciorthids, Typic Haplargids, and shallow Typic Durorthids on older fans. The soils are well drained. Soil temperature regimes are hyperthermic; and soil moisture regimes are aridic.

Vegetation. The predominant natural plant community on alluvial fans is Creosote bush - white bursage series. Mesquite series occurs in riparian areas along the Colorado River and Tamarisk series has invaded some riparian areas.

> **Characteristic series by lifeform include:**
> *Grasslands*: Big galleta series, Indian ricegrass series.
>
> *Shrublands*: Allscale series, Bush seepweed series, Brittlebush series, Brittlebush - white bursage series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbush series, Iodine bush series, Mixed saltbush series, Ocotillo series, Teddy-bear cholla series, White bursage series.
>
> *Forests and woodlands*: Blue palo verde - ironwood - smoke tree series, Mesquite series.

Climate. The mean annual precipitation is about 3 to 4 inches; it is all rain. Mean annual temperature is about 70° to 75° F. The mean freeze-free period is about 300 to 325 days.

Surface Water. Runoff is rapid from alluvial fans and slow from floodplain. Drainage is to the Colorado River. Streams, other than the Colorado River, have no water in some years and are dry most of each year in other years.

Subsection 322Be Chocolate Mountains and Valleys

This subsection includes the Orocopia and Chocolate Mountains on the southwest and the Chuckawalla, Little Chuckawalla, Palo Verde, and Mule Mountains on the northeast, valleys between these two rows of mountains, hills in these valleys, and Shaver Valley at the northwest end of the subsection. It is about half alluvial plain and pediment and half mountains and hills. It has a very hot arid climate. MLRA 30g.

Lithology and Stratigraphy. The mountains, hills, and pediments are mainly Mesozoic granitic, Tertiary volcanic, Eocene marine sedimentary, Oligocene and Miocene nonmarine sedimentary, Pre-Cretaceous metasedimentary, and Precambrian igneous and metamorphic rocks. There is a small area of Quaternary basalt at the southeast end of the Chocolate Mountains. The remainder of the subsection is mostly alluvium, but includes lacustrine deposits in Hayfield Lake.

Geomorphology. This section is on steep mountains, moderately steep hills, very gently to moderately sloping pediments and alluvial fans, and nearly level basin floors. Most of the mountains and larger valleys between the two rows of mountains are aligned northwest-southeast, but the Little Chuckawalla and Mules Mountains trend toward the northeast. Shaver Valley is aligned east-west. The elevation range is from about 200 to 2500 feet on alluvial plains and up to 3815 feet in the Orocopia Mountains, 3047 feet in the Chocolate Mountains, and 4500 feet in the Chuckawalla Mountains. Mass wasting and fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Lithic Torriorthents and Lithic Camborthids on mountains and hills, plus Typic Haplargids on volcanic rocks. They are mostly Typic Torrifluvents, Typic Torripsamments, and Typic Torriorthents on younger fans and basin-fill and mostly Typic Calciorthids, Typic Haplargids, and shallow Typic Durorthids on older fans. The soils are well drained. Soil temperature regimes are mostly thermic in the mountains and hyperthermic on pediments and alluvial plains. Soil moisture regimes are aridic.

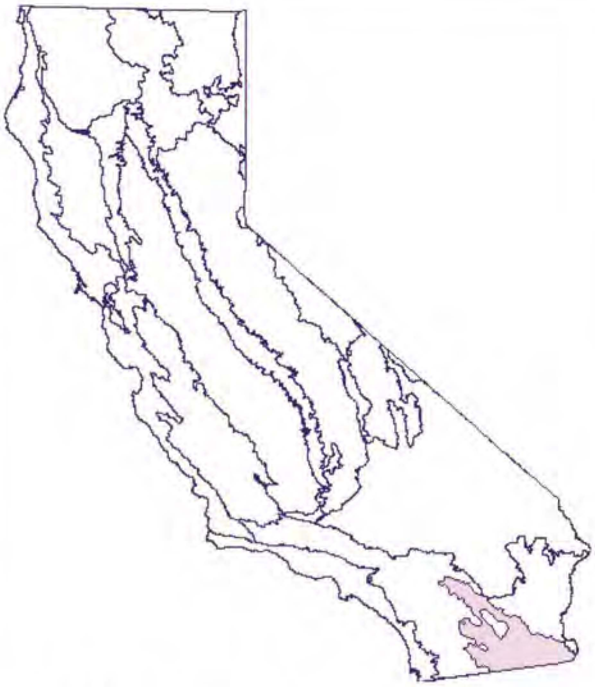
Vegetation. The predominant natural plant community is Creosote bush - white bursage series. Blue palo verde - ironwood - smoke tree series occurs in washes. Currently Tamarisk series occurs in riparian areas along the Colorado River.

Characteristic series by lifeform include:
Grasslands: Big galleta series, Indian ricegrass series.
Shrublands: Allscale series, All-thorn stands, Bush seepweed series, Brittlebush series, Brittlebush - white bursage series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Desert-holly series, Fourwing saltbush series, Iodine bush series, Mixed saltbush series, Ocotillo series, Teddy-bear cholla series, White bursage series.
Forests and woodlands: Blue palo verde - ironwood - smoke tree series, Mesquite series.

Climate. The mean annual precipitation is about 4 to 6 inches. It is practically all rain. Mean annual temperature is about 60° to 75° F. The mean freeze-free period is about 250 to 325 days.

Surface Water. Runoff is rapid from mountains and alluvial fans and slow from basin-fill. Drainage from the southeast end of the subsection is through Milpitas Wash to the Colorado River, and drainage from the northwest end is through Salton Creek or Box Canyon Wash toward the Salton Sea, or to Hayfield Lake. Streams have no water in some years and are dry most of each year in other years.

CHAPTER 16



Section 322C Colorado Desert

This section is a very hot part of the Basin and Range Province that is sometimes called the Salton Trough. The surface of sediments in the middle of the trough are about 275 feet below sea-level. The delta of the Colorado River is generally high enough to keep sea water out of the Salton Trough. In 1905, however, the Colorado River overflowed into the Salton Trough and the breach was not finally sealed until 1907. The current level of the Salton Sea is about 230 feet below sea level. An ancient lake, Lake Cahuilla, was higher long enough to produce shore-line features that reveal its greater size. The subsection is in MLRAs 30 and 31.

Geomorphology. Alluvial fans, basin, dunes and delta plain (Gulf of California). Basin and Range geomorphic province (Colorado Desert).

Lithology. Cenozoic sedimentary rocks and alluvial, lacustrine, and eolian deposits.

Soil Taxa. Aridisols and Entisols with hyperthermic soil temperature regimes and aridic soil moisture regimes.

Vegetation. Predominant potential natural communities includes the Creosote bush - white bursage series, Allscale series, Mixed salt bush series, Mesquite series, Ocotillo series and Fan palm series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: California annual grassland series, Gaint reed series and Tamarisk series.
>
> *Series that can occur in all subsections, but are not extensive*: Bulrush series, Bulrush - cattail series, Cattail series, Duckweed series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Saltgrass series, Sedge series and Spikerush series.
>
> *Series restricted to riparian settings*: Black willow series, Fremont cottonwood series, Mixed willow series, Mulefat series, Narrowleaf willow series and Red willow series.

Fauna. Mammals include desert bighorn sheep, desert kit fox, coyote, spotted skunk, spotted bat, black-tailed jackrabbit, ground squirrels, kangaroo rat and white footed mouse. Birds includes eagles, hawks, owls, quail, white-winged dove, roadrunners, finches, warblers and orioles. The Salton Sea provides habitat for a wide variety of waterfowl and shorebirds. Reptiles include several species of rattlesnakes.

Elevation. 230 feet below sea level to 2200 feet.

Precipitation. 3 to 6 inches.

Temperature. 68° to 75°F.

Growing Season. 300 to 350 days.

Surface Water Characteristics. Mostly bedrock controlled channels in mountains that carry seasonal flows through alluvial channels below to the Salton Sea. A few rivers that evolved from irrigation drainage water flow to the Salton Sea from Imperial and Coachella Valleys. The largest surface water feature is the Salton Sea (about 40 by 16 miles).

Disturbance Regimes.
Climate: Strong winds and drifting sand are common in parts of the area. Flash floods are commonly associated with the irregular occurrence of precipitation events. Precipitation does not occur every year.

Section 322C, Salton Sea area — *Charles B. Goudey*

Subsection 322Ca, Coachella area — *Charles B. Goudey*

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the early 1800's and early 1900's related to grazing, agriculture, and urbanization. Most of the section is converted to irrigated agriculture. Increased salinization of soil and water occurs in some areas as a result of modified drainage. Rapidly expanding urbanized areas are scattered throughout the section.

Cultural Ecology. Humans have been utilizing the area for some 10,000 years. After the end of the Pleistocene hunting traditions, Archaic assemblages reflect extensive practice of seasonal rounds for diversified hunting and gathering. Agricultural practices of Colorado River cultures spread throughout the area during late prehistoric times, after A.D. 1000; and, in just recent historic times, large areas have been converted to irrigated agriculture. The recently formed Salton Sea has become a mecca for retirement, recreation, and development. Contemporary attitudes and beliefs are varied; lifestyle is rural. The international border and large Hispanic populations contribute to cultural diversity; Hispanic populations comprise much of the agricultural, often migrant, workforce. The economy emphasizes agriculture, government employment, and recreation.

Subsections. The Colorado Desert section is divided into 4 subsections.

Subsection 322Ca
Coachella Valley

This subsection consists mostly of alluvial fans and lake basin of the Coachella Valley, from San Gorgonio Pass to the Salton Sea. It has a very hot, arid climate. MLRAs 30g, 31g, and 31h.

Lithology and Stratigraphy. Quaternary alluvial, lacustrine, and eolian deposits predominate in this subsection.

Geomorphology. This subsection is mainly on very gently to moderately sloping alluvial fans and nearly level basin floors and dry lake beds. Also, there are some Pliocene and Pleistocene nonmarine sediments that have been eroded and dissected to form "badlands", as in the Mecca Hills. The Coachella Valley is aligned toward northwest, but it curves around to the west along the Banning Fault; the Banning Fault being the southern branch of the San Andreas Fault, which splits in the Coachella Valley along two paths at the southern edge of the San Bernardino Mountains. The elevation range is from about -230 feet on the shore of the Salton Sea up to 1837 feet in the Mecca Hills and over 2000 feet in San Gorgonio Pass. Fluvial erosion and deposition and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Torrifluvents, Typic Torripsamments, and Typic Torriorthents. Coarse-loamy and coarse-silty Typic Torrifluvents predominate in lacustrine sediments and Typic Torripsamments in eolian sand. There are shallow Typic Torriorthents and Typic Calcior-thids in Pliocene and Pleistocene sediments that have been eroded to form "badlands". The soils are well drained, except on poorly drained playas. The soil temperature regimes are hyperthermic within the subsection, but they are thermic at San Gorgonio Pass. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush - white bursage series and, around the Salton Sea, Allscale series. Fan palm series occurs in many small riparian areas throughout the subsection. Mixed saltbush series and Mesquite series are common on basin floors, and Iodine bush series and Saltgrass series are present on wet basin-fill and lacustrine deposits.

Characteristic series by lifeform include:

Grasslands: Alkali sacaton series, Desert sand - verbena series, Giant reed series, Pickleweed series, Saltgrass series.

Shrublands: Allscale series, Arrow weed series, Bush seepweed series, Catclaw acacia series, Fourwing saltbush series, Iodine bush series, Mixed saltbush series, Scalebroom series.

Forests and woodlands: Fan palm series, Fremont cottonwood series, Mesquite series.

Climate. The mean annual precipitation is about 3 to 4 inches. It is all rain. Mean annual temperature is about 68° to 75° F. The mean freeze-free period is about 300 to 350 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin floor. Drainage is to the Salton Sea through the Whitewater River. Streams have no water in some years and are dry most of each year in other years. There is temporary ponding on playas, or dry lake beds, in some years.

Subsection 322Cb Borrego Valley - West Mesa

This subsection includes the Clark and Borrego Valleys, West Mesa, and Yuha Desert. They are on the southwest side of the Imperial Valley, between it and the Peninsular Ranges. The subsection has a very hot arid climate. MLRA 30h.

Lithology and Stratigraphy. Quaternary alluvial, lacustrine, and eolian deposits predominate in this subsection. Superstition Mountain, which protrudes through the alluvium on West Mesa, is mostly Mesozoic granitic rock; and Yuha Buttes on the Yuha Desert are Pliocene nonmarine and marine sedimentary rocks.

Geomorphology. This subsection is mainly on very gently to moderately sloping alluvial fans, terraces, and nearly level basin floors and dry lake beds. Also, there are some Pliocene and Pleistocene sediments that have been eroded and dissected to form "badlands." Clark and Borrego Valleys are aligned toward northwest, along the San Jacinto and Coyote Creek Faults. The elevation range is from about -230 feet on the shore of the Salton Sea up to about 2000 feet. The highest elevation in the Superstition Mountains, which trend toward the northwest, is 760 feet. Fluvial erosion and deposition and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Torrifluvents, Typic Torripsamments, and Typic Torriorthents on younger alluvial fans and lacustrine sediments, and Typic Calciorthids and Typic Haplargids on older fans and terraces. There are shallow Typic Torriorthents and Typic Calciorthids on Pliocene and Pleistocene sediments that have been eroded to form "badlands". Soils on granitic rocks of the rocky Superstition Mountains are Lithic and shallow Typic Torriorthents. The soils are well drained, except on poorly drained playas. The soil temperature regimes are hyperthermic. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Ocotillo series and Creosote bush - white bursage series and, around the Salton Sea, Allscale series. There are some small areas of Fan palm series in riparian areas. Mixed saltbush series is common on basin floors.

Characteristic series by lifeform include:

Grasslands: Alkali sacaton series, big galleta series, Desert sand - verbena series, Indian ricegrass series.

Shrublands: Allscale series, Arrow weed series, Birchleaf mountain-mahogany - California buckwheat series, Brittlebush series, Brittlebush - white bursage series, California buckwheat series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Crucifixion-thorn stands, Cupleaf ceanothus - fremontia - oak series, Desert-holly series, Elephant tree stands, Mojave yucca series, Nolina series, Ocotillo series, Teddy-bear cholla series, White bursage series.

Forests and woodlands: Blue palo verde - ironwood - smoke tree series, California sycamore series, Fan palm series, Fremont cottonwood series, Mesquite series.

Subsection 322Cb, near Ocotillo Wells — *Charles B. Goudey*

Climate. The mean annual precipitation is about 3 to 4 inches; it is all rain. Mean annual temperature is about 68° to 75° F. The mean freeze-free period is about 300 to 350 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin floor. Drainage is to the Salton Sea. Streams have no water in some years and are dry most of each year in other years. There is temporary ponding on playas, or dry lake beds, in some years.

Subsection 322Cc Imperial Valley

This subsection is on the lake plain of the Imperial Valley, which is southeast of the Salton Sea. It has a very hot, arid climate. MLRA 30h.

Lithology and Stratigraphy. This subsection contains Quaternary, and some Pliocene, lacustrine deposits. There are a few very small obsidian and pumice domes in a line from Obsidian Butte to Mullet Island at the southeast end of the Salton Sea.

Geomorphology. This subsection is practically all nearly level dry lake bed. The Imperial Valley is aligned toward the northwest. The elevation range is from about -230 feet on the shore of the Salton Sea up to about sea-level on the old shore-line of Lake Cahuilla. Fluvial erosion and deposition and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic and Vertic Torrifluvents in coarse-loamy, coarse-silty, fine-silty, and fine families. Also, there are some Typic Torripsamments and Typic Torriorthents. The soils are well drained, except on poorly drained playas. The soil temperature regimes are hyperthermic. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush - white bursage series and, around the Salton Sea, Allscale series. Mixed saltbush series and Mesquite series are common in riparian areas, and Iodine bush series and Saltgrass series are present around the margin of the Salton Sea.

> **Characteristic series by lifeform include:**
> *Grasslands*: Alkali sacaton series, Desert sand - verbena series, Indian ricegrass series, Pickleweed series, Saltgrass series.
>
> *Shrublands*: Allscale series, Arrow weed series, Bush seepweed series, Fourwing saltbush series, Iodine bush series, Mixed saltbush series.
>
> *Forests and woodlands*: Fremont cottonwood series, Mesquite series.

Climate. The mean annual precipitation is about 3 inches. It is all rain. Mean annual temperature is about 75° F. The mean freeze-free period is about 350 days.

Surface Water. Runoff is slow. Drainage is to the Salton Sea. The Alamo and New Rivers are the main conduits of overflow from the Colorado River.

Subsection 322Cd East Mesa - Sand Hills

This subsection includes alluvial fans, sand dunes, the Cargo Muchacho Mountains northeast of the Imperial Valley and the floodplain along the Colorado River. It has a very hot, arid climate. MLRAs 30h and 31g.

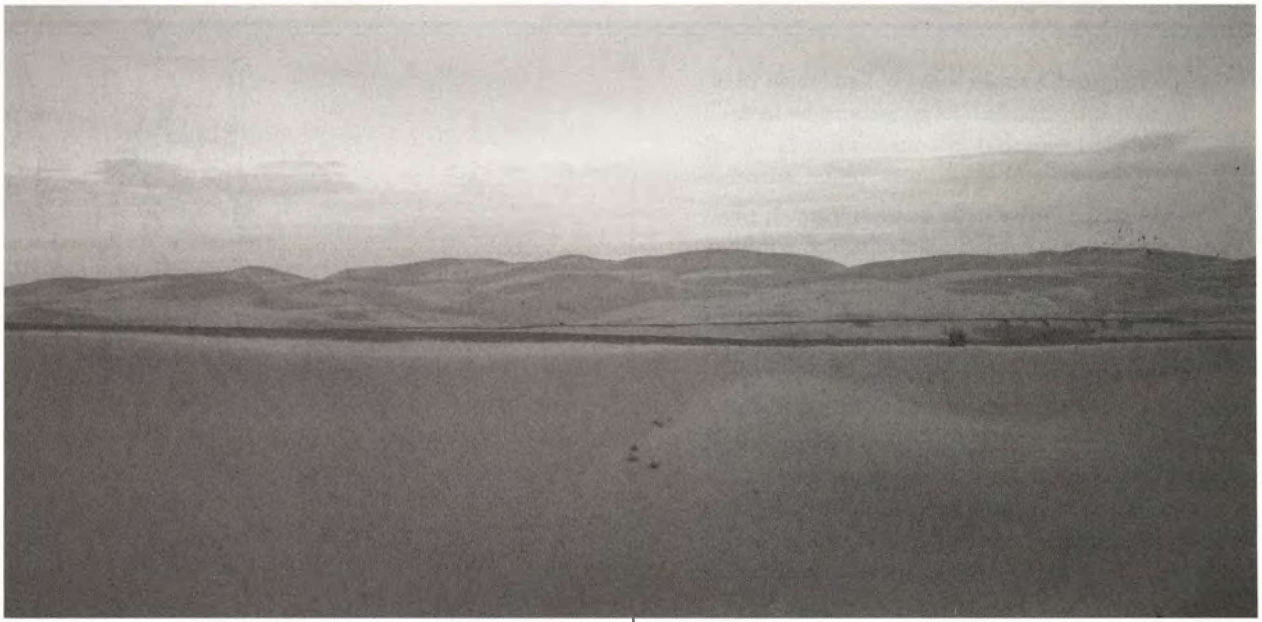
Lithology and Stratigraphy. Quaternary alluvial and eolian deposits predominate in this subsection. The Cargo Muchacho Mountains are Mesozoic granitic and Pre-Cretaceous metamorphic rocks, with the former predominating..

Geomorphology. This subsection consists mainly of very gently to moderately sloping alluvial fans, much of them covered by eolian sand, and moderately steep to steep sand dunes. The Cargo Muchacho Mountains and nearby Ogilby Hills are steep to very steep. There is a little pediment around the mountains. Some floodplain of the Colorado River is included in this subsection. The elevation range is from about sea-level to 1200 feet on alluvial fans up to 2221 feet in the Cargo Muchacho Mountains. Fluvial erosion and deposition and eolian deflation and deposition are the main geomorphic processes.

Soils. The soils are mostly Typic Torrifluvents, Typic Torripsamments, and Typic Torriorthents on younger fans, plus Typic Calciorthids and Typic Haplargids on older fans, and shallow Typic Torriorthents where Pleistocene of Pliocene sediments have been eroded to form "badlands". They are Typic Torripsamments in dune sand. Soils on the rocky Cargo Muchacho Mountains are mostly Lithic Torriorthents. Those on floodplain of the Colorado River are mostly Typic Torrifluvents. The soils are well drained. Soil temperature regimes are hyperthermic, and some are thermic on north-facing slopes at higher elevations. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities are Creosote bush series and Creosote bush - white bursage series. Vascular plants are sparse or absent from most of the Algodones Dunes and other sand hills. Fan palm series occurs in some canyons near the Chocolate mountains. Mesquite series occurs in some riparian areas, and Tamarisk series has invaded riparian areas along the Colorado River.

> **Characteristic series by lifeform include:**
> *Grasslands*: Big galleta series, Desert sand - verbena series, Indian ricegrass series.
>
> *Shrublands*: Catclaw acacia series, Creosote bush



Subsection 322Cd, Sand hills near Gordons Well — *Charles B. Goudey*

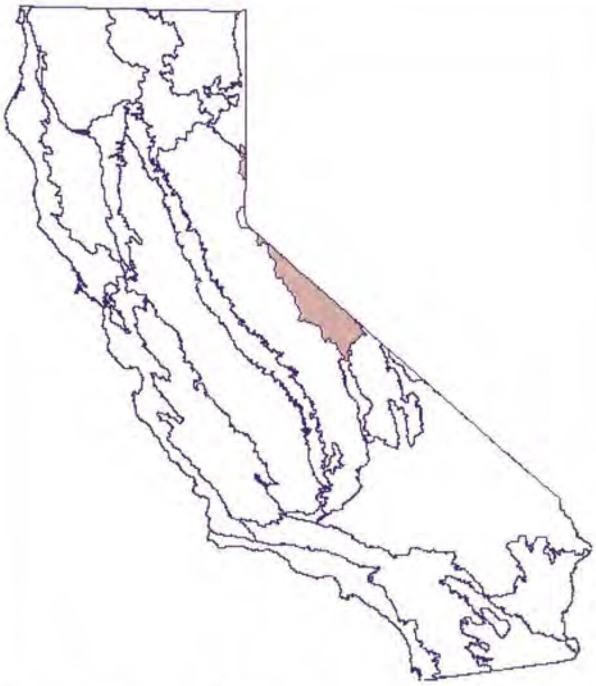
series, Creosote bush - white bursage series, White bursage series.

Forests and woodlands: Blue palo verde - ironwood - smoke tree series, Mesquite series.

Climate. The mean annual precipitation is about 3 to 4 inches. It is all rain. Mean annual temperature is about 68° to 75° F. The mean freeze-free period is about 300 to 350 days.

Surface Water. Runoff is rapid from most of the area. Drainage is mostly to the Salton Sea, or to the sand hills, where streams disappear, and, from the southeastern edge of the subsection, to the Colorado River. Streams have no water in some years and are dry most of each year in other years. There are no streams in the sand hills.

CHAPTER 17



Section 341D Mono

This section is in the western part of the Great Basin, just east of the Sierra Nevada. It is in MLRA 26.

Geomorphology. Isolated ranges (largely dissected block mountains) separated by aggraded desert plains (alluvial fans and basins). Basin and Range geomorphic province.

Lithology. Cenozoic volcanic rocks and alluvial deposits, Paleozoic sedimentary and volcanic rocks, and Mesozoic granitic rocks.

Soil Taxa. Alfisols, Aridisols, Entisols, Inceptisols, Mollisols and Vertisols in combination with mesic, frigid or cryic soil temperature regimes and aridic, xeric, or aquic soil moisture regimes.

Vegetation. Predominant potential natural communities includes the Big sagebrush series, Utah juniper series, Singleleaf pinyon series, Shadscale series, Low sagebrush series, Jeffrey pine series, White fir series, Aspen series and Bristlecone pine series.

The following series are found throughout the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

Series dominated by exotic plants: Cheatgrass series, Crested wheatgrass series, Introduced perennial grassland series, Kentucky bluegrass series and Tamarisk series.

Series that can occur in all subsections, but are not extensive: Bulrush series, Bulrush - cattail series, Bur-reed series, Cattail series, Cordgrass series, Ditch-grass series, Duckweed series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Sedge series and Spikerush series.

Series restricted to riparian settings: Arroyo willow series, Black cottonwood series, Black willow series, Common reed series, Fremont cottonwood series, Mixed willow series, Narrowleaf willow series, Red willow series and Water birch series.

Fauna. Pronghorn and mountain sheep were commonly found in the section. Presently pronghorn are limited to a few reintroduced herds and mountain sheep are found on a few high mountains. Mammals include mule deer, mountain lion, bobcat, coyote, jackrabbits and chipmunks. Birds include eagles, hawks, northern goshawk, nighthawks, common poorwill, sage grouse, sparrows and gnatcatchers. Mono Lake provides habitat to a wide variety of shorebirds and migrating waterfowl. It is also the second largest California gull rookery in the world. Sagebrush lizard, desert horned lizard, western fence lizard and spadefoot toad are common in the section.

Elevation. 4400 to 14200 feet.

Precipitation. 5 to 30 inches.

Temperature. 30° to 58°F.

Growing Season. 20 to 200 days.

Surface Water Characteristics. Few rapid flowing rivers and streams. Rivers and streams flow in deeply incised canyons with bedrock controlled channels (higher

Section 341D, White Mountains — *James R. Nelson* elevations) to alluvial channels (lower elevations) that terminate in basins or lakes within the area, or in basins and lakes in the Mojave Desert, Bonneville Basin and Northwestern Basin and Range sections. Several large lakes occur within the section.

Disturbance Regimes.
Fire: Fires are infrequent, low, moderate and high intensity surface or stand replacing fires.
Volcanic Activity: Contains locations with eruptive activity (lava flows and ash fall) within the past 200 years.
Seismic Activity: Seismically active area with strong shaking and ground rupture.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to mining, grazing, forestry and recreational activities.

Cultural Ecology. Humans have been utilizing the section for 10,000 years, and have been an integral part of its ecology for 3,000 to 5,000 years. Extensive prehistoric procurement and processing of obsidian resources have left vast areas pockmarked and littered with lithic debitage; extensive procurement and processing of piagi and pine nuts have modified vast areas of Jeffrey pine and pinyon. Historic mining booms beginning in the late 1800's and water diversion projects for the Los Angeles basin beginning in the early 1900's resulted in additional ecological modifications. Contemporary attitudes and beliefs emphasize amenity values. Human environment is characterized by a rural lifestyle of open space and out-door leisure activity. Recreation is the primary economic emphasis, trailed by government employment, lumbering, mining, and grazing.

Subsections. The Mono section is divided into 13 subsections.

Subsection 341Da Carson Valley - Truckee Meadows

This subsection consists mostly of an alluvial plain in Truckee Meadows and the Spanish Springs, Washoe, Carson, and Diamond Valleys. The climate is temperate and semi-arid. MLRA 26f.

Lithology and Stratigraphy. Quaternary alluvium predominates in this subsection. Hot Springs Mountain in Carson Valley is Triassic and Jurassic volcanic and sedimentary rocks, and there are Mesozoic granitic rocks and Tertiary andesite and silicic tuffs on Huffaker Hills, Prison Hill, Steamboat Hills, and on the divide between Carson and Washoe Valleys.

Geomorphology. This subsection is predominantly on gently to moderately sloping alluvial fans and pediments and nearly level floodplain, terraces, and basin floor. There are outwash fans at the foot of Mt. Rose and pediments on glacial outwash along the Truckee River. Moderately steep to steep hills are prominent but only small parts of the subsection. The elevation range is from 4400 to about 6000 feet. Fluvial erosion and deposition and freeze-thaw are the main geomorphic processes.

Soils. The soils are mostly Typic Torriorthents, Aridic Haploxerolls, and Xerollic and Durixerollic Haplargids on alluvial fans and pediments; Typic and Aquentic Haploxerolls and Typic Haplaquolls on floodplains and basin floors; and Aridic Lithic Haploxerolls, Aridic Haploxerolls, and Xerollic Haplargids on hills. They are Entic Xerumbrepts and Haploxerolls on younger and Aridic Argixerolls on older outwash fans at the foot of Mt. Rose. The soils are well to poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are mostly aridic, and some xeric (nearly aridic), plus wet soils in basin-fill that have aquic moisture regimes.

Vegetation. The predominant natural plant communities are Big sagebrush series on alluvial fans and Sedge meadow alliances on basin floors and floodplains. Low sagebrush series is common on shallow soils in hills. Jeffrey pine series occurs of some soils with xeric soil moisture regimes.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, Ashy ryegrass series, Beaked sedge series, Creeping ryegrass series, Indian ricegrass series, Needle-and-thread series, Saltgrass series.
Shrublands: Big sagebrush series, Bitterbrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbush series, Tobacco brush series.
Forests and woodlands: Curlleaf mountain-mahogany series, Jeffrey pine series.

Climate. The mean annual precipitation is about 7 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 45° to 54° F. The mean freeze-free period is in the range from 100 to 125 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin-fill. Truckee Meadows and Spanish Springs Valley drain to the Truckee River, which flows from Lake Tahoe in the Sierra Nevada to Pyramid Lake in the Great Basin. Diamond and Carson Valleys are drained by the Carson River, which flows to the Carson Sink. Washoe Lake in Washoe Valley has an ephemeral outlet to Steamboat Creek, which drains to the Truckee River.

Subsection 341Db Pine Nut Mountains

This subsection comprises the Pine Nut Mountains. It has a temperate to cold, semi-arid climate. MLRA 26f.

Lithology and Stratigraphy. The mountains contain mostly Pliocene volcanic rocks, largely andesite, and Triassic and Jurassic volcanic and sedimentary rocks. Also, there are Mesozoic granitic and Pre-Cretaceous metasedimentary rocks and some Quaternary alluvium in the subsection.

Geomorphology. Steep mountain slopes predominate in this subsection. There are some gently to moderately sloping pediments and alluvial fans. The mountains are oriented north-south. The elevation range is from about 5000 feet up to 9005 feet on Mt. Como. Mass wasting, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils are mostly Lithic Xerollic Haplargids, Aridic Haploxerolls, Aridic Argixerolls, Xerollic Haplargids, and Xerollic Paleargids. The soils are well drained. Soil temperature regimes are mesic at lower and frigid at higher elevations. Soil moisture regimes are mostly aridic, bordering xeric, and some xeric.

Vegetation. The predominant natural plant communities are Big sagebrush series on lower mountain slopes and Singleleaf pinyon series on higher mountain slopes. Utah juniper series occurs at intermediate elevations and some open Jeffrey pine series occurs at higher elevations.

> **Characteristic series by lifeform include:**
> *Grasslands*: Indian ricegrass series, Needle-and-thread series.
> *Shrublands*: Big sagebrush series, Bitterbrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series.
> *Forests and woodlands*: Curlleaf mountain-mahogany series, Jeffrey pine series, Singleleaf pinyon series, Singleleaf pinyon - Utah juniper series, Utah juniper series.

Climate. The mean annual precipitation is about 8 to 16 inches. Much of the precipitation is snow. Mean annual temperature is about 40° to 50° F. The mean freeze-free period is in the range from 75 to 100 days.

Surface Water. Runoff is rapid. It drains to the Carson River on the west or to the Walker River on the east side of the mountains. Streams in the mountains are dry most of each year. There is are no natural lakes in the subsection.

Subsection 341Dc Antelope - Mason Valley and Hills

This subsection includes Mason and Smith Valleys between the Pine Nut Mountains on the west and the Wassuck Range on the east, the valley of the Carson River north of the Pine Nut Mountains, Antelope Valley south of the Pine Nut Mountains, and the Singatse Range between Mason and Smith Valleys. The climate is temperate and arid to semi-arid. MLRA 26f.

Lithology and Stratigraphy. Quaternary alluvium predominates in this subsection. Bedrock in the Singatse Range and hills between the Wassuck Range and the Pine Nut Mountains is Triassic and Jurassic volcanic and sedimentary rocks and Tertiary andesite and tuffaceous sediments, plus some Jurassic and Cretaceous granitic rocks. Hills at the north end of the Pine Nut Range are mostly Tertiary andesite, basalt, and tuffaceous sediments.

Geomorphology. This subsection contains steep mountains, moderately steep hills, gently to moderately sloping alluvial fans and pediments, and nearly level floodplains, terraces, and basin floor. The Singatse Range and valleys on both sides of it are aligned north-south. The Carson River runs across this trend. The elevation range is from about 4200 feet up to 6778 feet on Mt. Wilson in the Singatse Range and on alluvial fans adjacent to the Wassuck Range. Mass wasting, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils on mountains and hills are mostly Lithic Camborthids; Lithic and Aridic Argixerolls; Lithic Xerollic and Xerollic Haplargids; and Typic, Xerollic, and Mollic Durorthids and Durargids. Those on alluvial fans are mostly Duric Mollic Camborthids, Mollic and Duric Haplargids, and Typic and Mollic Durargids. Those on floodplains and basin floors are mostly Aquic Xerorthents and Typic subgroups of Haplaquents, Haplaquepts, and Haplaquolls; also, there are Aquic Natrixerolls and Aquic Natrargids. There are Typic Torripsamments on eolian sand. The soils are well to poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are aridic, except for wet soils on floodplains and basin floors that have xeric or aquic moisture regimes.

Vegetation. The predominant natural plant communities are Shadscale series and, on floodplains and basin floors, Greasewood series, Saltgrass series, and Sedge meadow alliances. Low sagebrush series is common on shallow soils. Some Big sagebrush series and Singleleaf pinyon series occur at higher elevations. Indian ricegrass series predominates on eolian sand.

> **Characteristic series by lifeform include:**
> *Grasslands*: Alkali sacaton series, Ashy ryegrass series, Cordgrass series, Creeping ryegrass series, Indian ricegrass series, Needle-and-thread series, Saltgrass series.
> *Shrublands*: Allscale series, Bush seepweed series, Greasewood series, Low sagebrush series, Mixed saltbrush series, Scadscale series, Winter fat series.
> *Forests and woodlands*: Bittlebrush series, Curlleaf mountain-mahogany series, Singleleaf pinyon series.

Climate. The mean annual precipitation is about 5 to 10 inches. Much of the precipitation is snow. Mean annual temperature is about 42° to 54° F. The mean freeze-free period is in the range from 125 to 150 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin-fill. All runoff drains to the Walker River, except on the north side of the Pine Nut Mountains where runoff drains to the Carson River. Topaz Lake in Antelope Valley and Artesia Lake in Smith Valley are natural lakes, and there are some smaller ones on floodplain or basin floor along the Walker River in Mason Valley.

Subsection 341Dd Sweetwater Mountains - Pine Grove Hills

This subsection includes the Sweetwater Mountains, which are between the West Walker and East Walker Rivers; the Wellington and Pine Grove Hills, which are both contiguous with the Sweetwater Mountains on the northwest and northeast edges of the mountains; and Bridgeport Valley on the upper East Walker River. It has a cold, semi-arid to subhumid climate. MLRA 26f.

Lithology and Stratigraphy. The bedrock is mainly Mesozoic granitic and late Cenozoic volcanic and tuffaceous sedimentary rocks. Much of the volcanic rock is Pliocene basalt and Pliocene or Quaternary andesite. Also, there are Mesozoic granitic and Pre-Cretaceous sedimentary and metamorphic rocks, Quaternary alluvium, and Quaternary glacial till.

Geomorphology. Steep mountains and moderately steep to steep hills predominate in this subsection. Also, there are some gently to moderately sloping pediments and alluvial fans. Glacial moraines and floodplains are present along the West Walker River and in Bridgeport Valley. Most ridges in the subsection are oriented north-south, but a trend is not apparent in some areas of late Cenozoic volcanism that still have topography related to that volcanism. The elevation range is from about 5600 feet up to 9559 feet on Bald Mountain. Mass wasting, volcanism, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils are mostly shallow Xerollic Haplargids, shallow Aridic Haploxerolls, Aridic Argixerolls, shallow Typic Xeropsamments, and shallow Typic Cryopsamments on granitic rocks. There are shallow Xeric Torriorthents; shallow Xerollic Haplargids; Lithic Xerollic Haplargids; Lithic Ultic and Aridic Haploxerolls; Lithic Ultic, Aridic, Typic, and Pachic Argixerolls; Typic Durixerolls; and Pachic Cryoborolls on other kinds of rocks. Aridic Argixerolls and shallow Abruptic Xerollic Durargids are common on alluvial fans. Soils on moraines are mostly Typic Haploxerolls and Ultic Haploxeralfs. There are Typic Haplaquolls and Aquic Argixerolls on floodplains and basin floors. The soils are well drained, except for somewhat poorly to poorly drained soils on floodplains and basin floors. Soil temperature regimes are mostly frigid, and cryic at higher elevations. Soil moisture regimes are aridic, xeric, and aquic.

Vegetation. The predominant natural plant communities are mostly Big sagebrush series, much Singleleaf pinyon series, and some Curlleaf mountain-mahogany series. Jeffrey pine series and Limber pine series occur on higher mountain slopes, and Low sagebrush series on shallow soils. Sedge meadow alliances occur on floodplains and basin floors.

> **Characteristic series by lifeform include:**
>
> *Grasslands*: Alpine habitat, Ashy ryegrass series, Breaked sedge series, Creeping ryegrass series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series, Rocky Mountain series, Short sedge series, Tufted hairgrass series.
>
> *Shrublands*: Big sagebrush series, Bitterbrush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series.
>
> *Forests and woodlands*: Curlleaf mountain-mahogany series, Jeffrey pine series, Limber pine series Singleleaf pinyon series, Singleleaf pinyon - Utah juniper series, Utah juniper series.

Climate. The mean annual precipitation is about 10 to 30 inches. Much of the precipitation is snow. Mean annual temperature is about 35° to 45° F. The mean freeze-free period is in the range from 50 to 100 days.

Surface Water. Runoff is rapid in mountains, hills, pediments, and fans and slow from floodplains and basin floors. It drains to the Walker River. Streams from the Sierra Nevada are permanent, but those originating in the mountains of this subsection are dry much of each year. There are some closed depressions in volcanic terrain, but they are generally dry.

Subsection 341De Bodie Hills - Excelsior Mountains

This subsection includes the Excelsior Mountains; the Bodie, Anchorite, and Adobe Hills; and the Alkali and Huntoon Valleys. These hills and valleys are north and east of Mono lake. The climate is cold and semi-arid. MLRA 26f.

Lithology and Stratigraphy. Pliocene and some Quaternary basalt and more silicic volcanic rocks predominate in this subsection. There is some granitic and no other kinds of rock, except in the Excelsior

Subsection 341De, Warm Springs area — *James R. Nelson*

Mountains. In those mountains there are upper Paleozoic and lower Mesozoic volcanic and sedimentary, Mesozoic granitic, and Tertiary volcanic rocks. Quaternary alluvium fills Alkali and Huntoon Valleys.

Geomorphology. The landforms are mostly moderately steep to steep hills, steep mountains, and gently to moderately sloping volcanic flows. The elevation range is from about 5200 feet up to 10,235 feet at Potato Peak on Bodie Mountain. Volcanic craters and cones are common in the hills. The hills lack definite elongation and orientation, except Anchorite Hills which are aligned toward the north-northeast. The Excelsior Mountains are elongated and have three segments aligned north-northeast, northeast, and east-northeast. Mass wasting, volcanism, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils on volcanic rocks are mostly Lithic Mollic Haploxeralfs, Lithic and Typic Argixerolls, shallow Xerollic Durargids, Abruptic Durixeralfs, Mollic Palexeralfs, and Typic, Vitrandic, and Argic Cryoborolls. Soils in the Excelsior Mountains are mostly Lithic and Typic Xerorthents, Lithic and Typic Xeropsamments, Mollic Camborthids, Mollic Haplargids, and Mollic Durorthids. The soils are well drained. Soil temperature regimes are mostly frigid, and cryic at higher elevations. Soil moisture regimes are aridic and xeric (nearly aridic).

Vegetation. The predominant natural plant communities are Big sagebrush series, Singleleaf pinyon series, and Utah juniper series. Low sagebrush series occurs on shallow soils.

Characteristic series by lifeform include:

Grasslands: Indian ricegrass series, Needle-and-thread series.

Shrublands: Big sagebrush series, Bitterbrush series, Low sagebrush series, Rubber rabbitbrush series.

Forests and woodlands: Singleleaf pinyon series, Singleleaf pinyon - Utah juniper series, Utah juniper series.

Climate. The mean annual precipitation is about 12 to 25 inches. Much of the precipitation is snow. Mean annual temperature is about 32° to 48° F. The mean freeze-free period is in the range from 25 to 100 days.

Surface Water. Runoff is rapid. Most of it drains to Mono Lake on the southwest or to Walker Lake. Huntoon Valley is in the bottom of a closed basin. Streams are dry most of each year. There are some closed depression in volcanic terrain, but they are generally dry.

Subsection 341Df
Mono Valley

This subsection consists of the lake plain around Mono Lake, which is at the base of the steep eastern slope of the Sierra Nevada. It has a temperate, semi-arid climate. MLRA 26f.

Lithology and Stratigraphy. Pleistocene and recent lacustrine deposits predominate in this subsection. There is some recent andesite and pyroclastics from volcanoes on Paoha and Negit Islands in Mono Lake and at Black Point on the north shore of the lake.

Geomorphology. The landform is mostly nearly level to gently sloping lake plain. Mono Valley is slightly elongated toward the northeast. The lake plain slopes southwest, so Mono Lake is at the southwest end of the valley. A sequence of several old beach ridges is evident on the northeast side of the valley. The elevation range is from about 6400 feet at the present lake level up to 7180 feet at the highest Pleistocene lake level. The present lake is saline and alkaline, containing about 6% salt. Tufa mounds are prominent features around the lake. Lacustrine deposition and volcanism are the main geomorphic processes.

Soils. The soils are mostly Xeric Torripsamments and Torriorthents, Haploxerollic Durorthids, and Xerollic Haplargids. There are also shallow Xerollic Durargids and Abruptic Durixeralfs on volcanic rocks. The soils are well drained. Soil temperature regimes are mesic; and soil moisture regimes are aridic.

Subsection 341Df, Mono Lake area looking east toward Powell Mountain — *Robert Ettner*

Vegetation. The predominant natural plant communities are Big sagebrush series and some Singleleaf pinyon series and Bitterbrush series. Greasewood series occurs in seep areas.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, Ashy ryegrass series, Creeping ryegrass series, Indian ricegrass series, Needle-and-thread series, Saltgrass series.
Shrublands: Allscale series, Bush seepweed series, Mixed saltbush series, Rubber rabbitbrush series, Shadscale series.
Forests and woodlands: Singleleaf pinyon series.

Climate. The mean annual precipitation is about 12 to 15 inches. Much of the precipitation is snow. Mean annual temperature is about 48° to 50° F. The mean freeze-free period is in the range from 100 to 150 days.

Surface Water. Mono Lake is in a closed basin that was occupied by Pleistocene Lake Russell. The maximum height of the lake, 7810 feet, was controlled by overflow into Adobe Valley. Much water from Sierra Nevada streams which flow to Mono Lake has been diverted for municipal use, lowering the lake level. Recent regulation of water diversion has halted the decline in lake level.

Subsection 341Dg
Wassuck Range

This subsection comprises the Wassuck Range, which is just west of Walker Lake. It is completely in Nevada and is included to complete the section. The climate is cold and semi-arid to subhumid. MLRA 26f.

Lithology and Stratigraphy. The bedrock is mostly Mesozoic granitic and some Mesozoic volcanic and sedimentary rocks, and lesser amounts of Tertiary silicic ash-flow tuffs and tuffaceous sedimentary rocks.

Geomorphology. Steep mountain slopes predominate in this subsection. The mountain range is aligned north-south. The elevation range is from about 4000 feet adjacent to Walker Lake up to 11,239 feet on Mount Grant. Mass wasting, fluvial erosion, and freeze-thaw are the main geomorphic processes.

Soils. The soils are mostly Typic and Lithic Xerorthents and Typic Xerochrepts, and lesser areas of Lithic Torriorthents, Mollic and Lithic Mollic Haplargids, shallow Mollic Durorthids, and Cryoborolls. The soils are well drained. Soil temperature regimes are mesic at lower and frigid at higher elevations with some cryic. Soil moisture regimes are mostly aridic and xeric.

Vegetation. The predominant natural plant communities, from low to high elevations, are Shadscale series, Big sagebrush series, Utah juniper series, and Singleleaf pinyon series. Low sagebrush series occurs on shallow soil at higher elevations. Curlleaf mountain mahogany series occurs at higher elevations.

Characteristic series by lifeform are not provided for this subsection.

Climate. The mean annual precipitation is about 6 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 35° to 50° F. The mean freeze-free period is in the range from 50 to 125 days.

Surface Water. Runoff is rapid. It drains to Walker Lake, either directly or through the Walker River. Streams in the mountains are dry most of each year. There is are no natural lakes in the subsection.

Subsection 341Dh
Crowley Flowlands

This subsection includes the Benton Range, Blind Spring Hill, Granite Mountain, Mono Craters, Volcanic Tableland south of the Benton Range, Pumice Valley, Adobe Valley and Long Valley. It is between the Sierra Nevada on the southwest, the White Mountains on the east, and Mono Lake and the Adobe Hills on the north, excluding subsection 341Dl. It has a temperate to cold, semi-arid to subhumid climate. MLRA 26f.

Lithology and Stratigraphy. Quaternary volcanic, largely pyroclastic, and Mesozoic granitic rocks predominate in this subsection. Bishop tuff, which emanated from the site of the Long Valley Caldera, blankets much of the area and is many yards thick on the Tablelands. Also, in the Benton Range, there are Paleozoic marine and Pre-Cenozoic granitic and metamorphic rocks. There is Quaternary alluvium in Adobe and Long Valleys and lacustrine deposits in Long Valley. Long

Subsection 341Dh, Lake Crowley area,
M261Er in background —*James R. Nelson*

valley is in the eastern half of the Long Valley Caldera. There is some glacial till adjacent to the Sierra Nevada.

Geomorphology. The landforms are mostly steep mountains and hills, gently to moderately sloping volcanic flows and tablelands, nearly level basin floors, and very gently to moderately sloping alluvial fans. All elongated features, the Benton Range, Blindspring Hill, and the row of Mono craters, are oriented north-south. The elevation range is from about 4200 feet up to 8121 in the Benton Range and 8920 feet on Granite Mountain. Mass wasting, volcanism, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils on volcanic rocks are mostly Lithic Xeric Torriorthents, Lithic and Xeric Torripsamments, Xerollic Camborthids, Lithic Xerollic and Typic Argixerolls, Palexerollic Durixerolls, Xerollic and shallow Haploxerollic Durargids, Typic Durixeralfs, and Typic Chromoxererts. Those on other kinds of rock are mostly shallow Typic Torriorthents and Torripsamments, shallow Entic Haploxerolls, Typic Argixerolls, and Lithic Xerollic Haplargids. Soils on fans and basin floors are Typic Torriorthents; Xeric Torripsamments; Xerollic, Duric, and Durixerollic Haplargids; Haploxerollic Durorthids; and Aeric Haplaquepts. The soils are well drained, except for somewhat poorly drained soils on basin floors. Those on glacial till are mostly Xeric Torriorthents and Aridic Haploxerolls. Soil temperature regimes are mostly mesic and frigid, but cryic at the highest and thermic at the lowest elevations. Soil moisture regimes are aridic and xeric.

Vegetation. The predominant natural plant communities are Big sagebrush series and Singleleaf pinyon series. Jeffrey pine series occurs at higher elevations, and Black bush series occurs on the Tablelands south of the Benton Range. Other series in this subsection are Lodgepole pine at higher elevations, Aspen in areas where snow accumulates, Bitterbrush, and Curlleaf mountain mahogany. Willow thicket alliances in wet areas. Pumice forb habitats are present, but lack a description. There is a minor amount of Shadscale series on the lower end of the Tablelands.

Characteristic series by lifeform include:

Grasslands: Alkali sacaton series, Ashy ryegrass series, Creeping ryegrass series, Indian ricegrass series, Needle-and-thread series, Saltgrass series.

Shrublands: Allscale series, Big sagebrush series, Black bush series, Bitterbrush series, Low sagebrush series, Mixed saltbush series, Rarry rabbitbrush series, Rubber rabbitbrush series, Shadscale series, Tobacco brush series.

Forests and woodlands: Jeffrey pine series, Singleleaf pinyon series, Utah juniper series.

Climate. The mean annual precipitation is about 12 to 25 inches. Much of the precipitation is snow. Mean annual temperature is about 35° to 54° F. The mean freeze-free period is in the range from 100 to 150 days.

Surface Water. Runoff is rapid from mountains, hills, and fans and slow on basin floors. Most of it, even from formerly closed Long Valley, drains to the Owens River, but some drains to Mono Lake. Most streams are dry most of each year. Only the Owens River and streams from the Sierra Nevada run water through the summer.

Subsection 341Di
Benton - Upper Owens Valleys

This subsection includes the Queen, Benton, Hammil, Chalfant, and upper part of the Owens Valleys (actually one valley with different names for different segments of it) along the western margin of the White Mountains, and Round Valley, which is at the western margin of the Sierra Nevada. It has a hot to temperate, arid climate. MLRAs 26f and 30g.

Lithology and Stratigraphy. Quaternary alluvium pervades the entire subsection.

Geomorphology. The landforms are gently to moderately sloping alluvial fans and nearly level floodplains, basin floors, and terraces. All valleys are aligned north-south, except Queen Valley, which trends northeast at the northern end of the White Mountains. The elevation range is about 3900 feet to 6000. Fluvial erosion and deposition are the main geomorphic processes.

Soils. The soils are mostly Xeric and Typic Torrifluvents, Xeric and Typic Torriorthents, Xeric Torripsamments, Aquic Xerofluvents, Typic Camborthids, Xerollic and Typic Haplargids, and Typic Natrargids. The soils are well drained, except for few somewhat poorly drained soils on floodplains and basin floors. Soil temperature regimes are mesic and thermic. Soil moisture regimes are mostly aridic, and some xeric where ground-water affects the moisture regime.

Vegetation. The predominant natural plant communities are Shadscale series, Big sagebrush series, Mixed saltbush series, and Desert scrub alliances. Other series, which are commonly associated with seeps, riparian, or alkali sink areas, are Greasewood, Alkali sacaton, and Saltgrass.

Subsection 341Di, Upper Owens Valley foreground, 341Dj background — *Robert Ettner*

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, Ashy ryegrass series, Beaked sedge series, Cordgrass series, Creeping ryegrass series, Indian ricegrass series, Needle-and-thread series, Saltgrass series.

Shrublands: Allscale series, Big sagebrush series, Bitterbrush series, Bush seepweed series, Fourwing saltbush series, Rubber rabbitbrush series, Shadscale series, Winter fat series.

Climate. The mean annual precipitation is about 6 to 8 inches. Most of the precipitation is rain. Mean annual temperature is about 48° to 58° F. The mean freeze-free period is in the range from 150 to 200 days.

Surface Water. Runoff is rapid from fans and slow on basin floors. The Owens River and some streams from the Sierra Nevada are perennial, but others are dry most of each year.

Subsection 341Dj White Mountains

This subsection comprises the White Mountains, the highest mountain range in the Great Basin. It has a temperate to very cold, arid to semi-arid climate. MLRA 26f.

Lithology and Stratigraphy. Mesozoic granitic, Cambrian marine sedimentary, Precambrian sedimentary and Pre-Cretaceous metamorphic rocks predominate in this subsection. There is Quaternary glacial till in many of the canyons on the east side of the mountains, but it is not extensive..

Geomorphology. The landforms are steep to very steep mountains with narrow to broad ridge tops. They are aligned toward the north-northeast. The elevation range is from about 5000 feet up to 14,246 feet on White Mountain Peak. Much of the main ridge is above 12,000 feet. Mass wasting, fluvial erosion, and freeze-thaw are the main geomorphic processes.

Soils. The soils are mostly shallow in Typic subgroups of Torriorthents, Cryopsamments, and Haplargids, shallow Entic Haploxerolls, and Dystric Xeropsamments on granitic rocks and Lithic Torriorthents, Lithic Xerollic Haplargids, and Typic and Aridic Argixerolls on other kinds of rocks. The soils are well drained. Soil temperature regimes are mesic, frigid, and cryic. Soil moisture regimes are mostly aridic, and some xeric.

Vegetation. The predominant natural plant communities are Shadscale series at lower elevations; Big sagebrush, Utah juniper, and Singleleaf pinyon series at intermediate elevations; Five-leaved pine forest alliances at higher elevations; and communities of Alpine habitats at the highest elevations. At intermediate elevations, Low sagebrush series is common on shallow soils and Black sagebrush series is common on limestone and dolomite. At higher elevations, the five-leaved pine forests are Limber pine series on granitic rocks and Bristlecone pine series on limestone and dolomite. Curlleaf mountain mahogany is another common series. Aspen series occurs on the east slopes of the mountain range. Lodgepole pine series is less common.

Characteristic series by lifeform include:
Grasslands: Alpine habitat, Beaked sedge series, Creeping ryegrass series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series, Rocky Mountain series, Short sedge series, Tufted hairgrass series.

Subsection 341Dj, White Mountains — *James R. Nelson*

Shrublands: Allscale series, Big sagebrush series, Black sagebrush series, Bittlebrush series, Fourwing saltbush series, Low sagebrush series, Mixed saltbush series, Shadscale series,

Forests and woodlands: Aspen series, Bristlecone pine series, Curlleaf mountain-mahogany series, Limber pine series, Lodgepole pine series, Singleleaf pinyon series, Singleleaf pinyon Utah juniper series, Utah juniper series.

Climate. The mean annual precipitation is about 8 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 30° to 50° F. The mean freeze-free period is in the range from < 25 to 150 days.

Surface Water. Runoff is rapid. Steams are dry most of each year.

Subsection 341Dk Fort Sage Mountains - Lemmon Valley

This subsection includes mountains, hills, and valleys between the Sierra Nevada on the west and the Pah Rah Range and Pyramid Lake on the east. The larger mountains are the Fort Sage Mountains, Virginia Mountains, Dogskin Mountain, and Petersen Mountain. The larger valleys are Long Valley, Lemmon Valley, and Warm Springs Valley. The climate is temperate to cold, and semi-arid. MLRA 26F.

Lithology and Stratigraphy. Tertiary basalt predominates in the mountains and hills. Also, there are Cenozoic tuff and tuffaceous sediments and Quaternary basalt. Mesozoic granitic and Pre-Cretaceous metavolcanic rocks are exposed beneath the volcanic rocks on the western side of the subsection. The valleys contain Quaternary alluvial and lacustrine deposits. Tertiary lacustrine deposits are extensive in Long Valley.

Geomorphology. This subsection contains steep mountains, moderately steep hills, gently to moderately sloping alluvial fans, and nearly level floodplains and basin floors. The mountains are aligned north-south in the southern and eastern parts of the subsection, curving around to the northwest in the northwestern part. The elevation range is from about 4000 feet adjacent to Pyramid Lake up to 7990 feet in the Fort Sage Mountains and 8722 feet on Tule Peak in the Virginia Mountains. Mass wasting, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils on mountains and hills are mostly Lithic, Aridic, Aridic Calcic, Aridic Pachic, and Pachic Argixerolls; Lithic Xerollic and Xerollic Haplargids; Entic Ultic Haploxerolls; and shallow Xerollic Durargids. Those on granitic rocks are mostly shallow Xeric Torripsamments, Torripsammentic and Entic Haploxerolls, and shallow Aridic and Ultic Argixerolls. Soils on alluvial fans are mostly Typic Torriorthents, Aridic Haploxerolls, Pachic Argixerolls, Xerollic Haplargids, and Abruptic Xerollic Durargids. Those on floodplains and basin floors are mostly Typic Xerofluvents, Aridic Cumulic Haploxerolls, Typic Haplaquepts, Typic Haplaquolls, Aquic Argixerolls, and Aquic Natrargids. Also, there are Chromoxererts on dry lake beds. The soils are well drained, except for somewhat poorly to poorly drained soils on floodplains and basin floors. Soil temperature regimes are mesic and frigid. Soil moisture regimes are mostly aridic at lower elevations and xeric at higher elevations. Ephemerally to permanently wet soils on floodplains and basin floors have xeric or aquic moisture regimes.

Vegetation. The predominant natural plant communities are Big sagebrush series at lower and Utah and Western juniper series at higher elevations. Shadscale series prevails at low elevations near Pyramid Lake. Greasewood series, Saltgrass series, and Sedge meadow alliances occur on somewhat poorly to poorly drained floodplains and basin floors. Low sagebrush series is common on shallow soils.

Characteristic series by lifeform include:

Grasslands: Alkali sacaton series, Ashy ryegrass series, Beaked sedge series, Bluebuch wheatgrass series, Cordgrass series, Creeping ryegrass series, Indian ricegrass series, Needle-and-thread series, Saltgrass series.

Shrublands: Allscale series, Big sagebrush series, Bitterbrush series, Bush seepweed series, Fourwing saltbush series, low sagebrush series, Mixed saltbush series, Rubber rabbitbrush series, Shadscale series, Winter fat series.

Forests and woodlands: Utah pinyon series, Mountain juniper series.

Climate. The mean annual precipitation is about 6 to 16 inches. Much of the precipitation is snow. Mean annual temperature is about 35° to 54° F. The mean freeze-free period is in the range from 75 to 150 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin floors. Some drainages are closed, with ephemeral lakes in the valleys, but much of the runoff is to Pyramid Lake or to Honey Lake.

Subsection 341DI
Glass Mountain

This subsection encompasses volcanic peaks and craters on a volcanic plain northeast of the Sierra Nevada below Mammoth Pass, Little Antelope Valley, and a high ridge north of Long and Little Antelope Valleys. It has a cold to very cold, semi-arid to subhumid climate. MLRA 26f, and 22e.

Lithology and Stratigraphy. The bedrock is mainly Quaternary rhyolite, including obsidian, and tephra. Also, there is some Mesozoic volcanic rock and Pliocene basalt.

Geomorphology. This subsection contains mostly moderately steep mountains, a steep scarp on the north side of Long Valley Caldera, and gently to moderately sloping volcanic plain. The Inyo Craters are a series of hills in the same north-south alignment as the Mono Craters in subsection 341Dh. The highest land is on an east-west arc along the north edge of Long Valley Caldera. This oval caldera is a slightly elongated, east-west, depression formed by collapse about 3/4 million years ago of the vent for Bishop tuff. It is now occupied by the Little Antelope and Long Valleys and, in the center, a hill formed by volcanic activity following collapse of the vent. The elevation range is from about 7000 feet up to 11123 feet on Glass Mountain. Volcanism, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils are mostly Lithic and Lithic Ultic Argixerolls, Ultic Haploxeralfs, Dystric Xeropsamments, Andic Xerumbrepts, Dystric Xeropsamments, and shallow Typic Cryopsamments. Also, there are shallow Typic Torripsamments, Lithic Xerollic Haplargids, and Typic Argixerolls on granitic rocks. The soils are well drained. Soil temperature regimes are mostly frigid, and some cryic at higher elevations. Soil moisture regimes are mostly xeric, and some aridic.

Vegetation. The predominant natural plant community is Jeffrey pine series. White fir series is common at higher elevations, Lodgepole pine series occurs in cold-air drainage-ways, and Singleleaf pinyon series is common in dry areas. Other series in this subsection are Aspen in areas where snow accumulates, Bitterbrush, Big Sagebrush, and Curlleaf mountain mahogany. Willow thicket alliances occur in wet areas, and there are Subalpine meadow habitats. Pumice forb habitats are present, but lack a description.

Characteristic series by lifeform include:

Grasslands: Alpine habitat, Ashy ryegrass series, Indian ricegrass series, Beaked sedge series, Creeping ryegrass series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.

Shrublands: Big sagebrush series, Bitterbush series, Low sagebrush series, Parry rabbitbrush series, Rubber rabbitbrush series, Tobacco brush series.

Forests and woodlands: Jeffrey pine series, Limber pine series, Lodgepole pine series, Red fir series, Singleleaf pinyon series, White fir series.

Climate. The mean annual precipitation is about 15 to 30 inches. Much of the precipitation is snow. Mean annual temperature is about 32° to 40° F. The mean freeze-free period is in the range from 25 to 150 days.

Surface Water. Runoff is rapid; most of the soils have high infiltration rates. Most of the runoff is to the Owens River, but some is to Mono Lake. Much of the area lacks integrated drainage systems, because of recent flows and tephra deposits. The Owens River and streams from the Sierra Nevada run water through the summer.

Subsection 341Dm Virginia - Pah Rah Ranges

This subsection comprises the Virginia Range south of the Truckee River and the Pah Rah Range north of the Truckee River. The subsection is completely in Nevada and is included to complete the section. It has a cold, semi-arid climate. MLRA 26f.

Lithology and Stratigraphy. Tertiary andesite, and possibly some dacite, flows and breccias predominate in the Virginia Range. Tertiary basalt and andesite flows predominate in all but the northern part of the Pah Rah Range, where silicic ash-flow tuffs predominate. Tertiary tuffaceous sedimentary rocks are common in both ranges and Quaternary andesite flows and breccias are common in the Virginia Range. Small areas of Mesozoic granitic rocks and other kinds of Jurassic and Triassic rocks are present in both ranges.

Geomorphology. Steep mountain slopes predominate in this subsection. There are some volcanic plateaus, moderately steep hills, and gently to moderately sloping pediments and alluvial fans. Some small closed basins occur on the volcanic plateaus. The Truckee River flows on a narrow floodplain. The mountains are aligned toward the northeast on the southeast side of the Virginia Range, toward the northwest at the north end of the Pah Rah Range, and north-south in the middle and on the west sides of the Ranges. The elevation range is from about 4500 feet along the Truckee River to over 7600 feet on the ridge between Wakefield Peak and Orleans Hill in the Virginia Range and 8367 feet on Virginia Peak in the Pah Rah Mountains. Mass wasting, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils are mostly Xerollic Haplargids and lesser amounts of Lithic Xerollic Haplargids, Torriorthentic Lithic and Aridic Pachic Haploxerolls, Aridic Pachic Argixerolls, and "bleached land". The "bleached land" is soft, hydrothermally altered volcanic rock with little soil. Small areas of Typic Chromoxererts occur on volcanic plateaus, on pediments, and in basins; and there are some Xerollic and shallow Palexerollic Durargids on alluvial fans. Typic and Aquic Xerorthents occur on floodplain along the Truckee River. The soils are well drained, except somewhat poorly drained soils along the Truckee River. Soil temperature regimes are mostly frigid, with mesic along the Truckee River. Soil moisture regimes are mostly aridic, bordering xeric, and some are xeric.

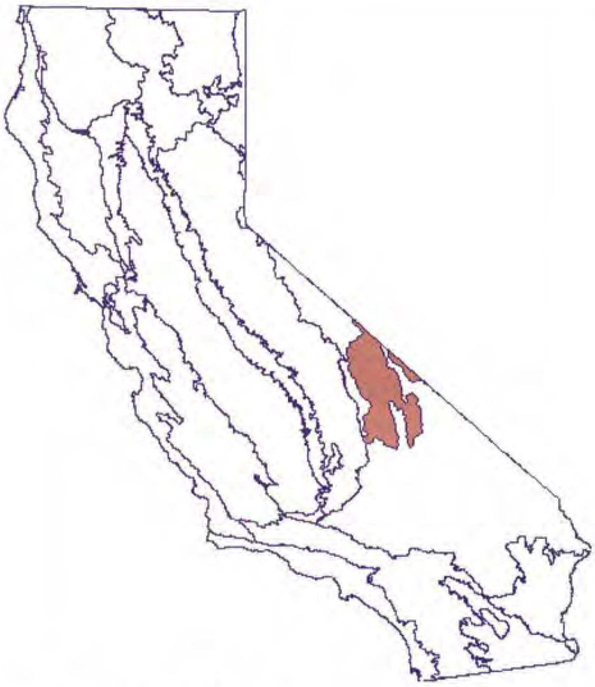
Vegetation. The predominant natural plant communities are Big sagebrush series and, at higher elevations, Utah and Western juniper series. Low sagebrush series is common on shallow soils, and Mixed chaparral shrublands are common on rocky and stony Haploxerolls and Argixerolls. Singleleaf pinyon series occurs on Aridic Pachic Haploxerolls. Jeffrey pine series occupies acid soils of "bleached land". Shadscale series occurs on shallow Durargids with mesic soil temperature regimes.

Characteristic series by lifeform are not provided for this subsection.

Climate. The mean annual precipitation is about 6 to 18 inches. Much of the precipitation is snow. Mean annual temperature is about 42° to 50° F. The mean freeze-free period is in the range from 100 to 125 days.

Surface Water. Runoff is rapid from the mountains and dissected volcanic plateaus, but there are some closed basins on volcanic plateaus. Most of the runoff drains to the Truckee River or its tributaries. The southern edge of the subsection is in the Carson River drainage basin and runoff from the northern part drains to Pyramid lake without passing through the Truckee River. Streams in the mountains are dry most of each year, although the Truckee River is a permanent stream. There is ephemeral ponding in some of the small closed basins, but there are no natural lakes in the subsection.

CHAPTER 18



Section 341F Southeastern Great Basin

This section comprises the southern Great Basin in the Basin and Range geomorphic province. It is in MLRA 29. Section 341F was extended into California after the Ecoregions and Subregions of the United States map was prepared. The extent of this section and its' subsections is shown on the Ecological Units of California, Subsections map.

Geomorphology. Widely separated short ranges in desert plains. Contains isolated mountains, plateaus, alluvial fans, playas, basins and dunes. Basin and Range geomorphic province.

Lithology. Paleozoic marine sedimentary rocks, Quaternary, Tertiary and Miocene volcanic rocks, Mesozoic and Jurassic granitic rocks, and alluvial deposits.

Soil Taxa. Aridisols, Entisols, Inceptisols, Mollisols in combination with thermic, mesic or frigid soil temperature regimes and aridic, xeric or aquic soil moisture regimes.

Vegetation. Predominant potential natural communities includes the Big sagebrush series, Singleleaf pinyon series, Utah juniper series, Low sagebrush series, Shadscale series, Mixed saltbrush series and Bristlecone pine series.

The following series are found throughout the California portion of the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

Series dominated by exotic plants: Tamarisk series.

Series that can occur in all subsections, but are not extensive: Bulrush series, Bulrush - cattail series, Cattail series, Cordgrass series, Duckweed series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Sedge series and Spikerush series.

Series restricted to riparian settings: Arrow weed series, Black willow series, Fremont cottonwood series, Mixed willow series, Narrowleaf willow series and Red willow series.

Fauna. Mammals include desert bighorn sheep, desert kit fox, coyote, spotted skunk, spotted bat, black-tailed jackrabbit, ground squirrels, kangaroo rat and white footed mouse. Birds includes eagles, hawks, owls, quail, roadrunners, finches, warblers and orioles. Reptiles include desert tortoise, several species of rattlesnakes and chuckawalla lizard.

Elevation. 1000 to 11000 feet.

Precipitation. 4 to 20 inches.

Temperature. 35° to 72°F.

Section 341F, Panamint Range area,
Inyo Mountains in background — *James R. Nelson*

Growing Season. 100 to 275 days.

Surface Water Characteristics. Mostly bedrock controlled channels in mountains that carry seasonal flows to alluvial channels below. Most channels terminate in basins within the section.

Disturbance Regimes.
Fire: Areas with less than about 8 inches of rainfall rarely support enough vegetation to carry a fire. Fire occurrence in areas receiving more than about 8 inches has been influenced by introduced grasses. Fires are variable in frequency and intensity.
Climate: Flash floods are commonly associated with the irregular occurrence of precipitation events.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the late 1800's and early 1900's related to mining and grazing. Since the early 1900's, significant effects on some plant and animal species occur at widely scattered locations associated with military testing and recreational activities.

Cultural Ecology. to be written

Subsections. Six subsections of the Southeastern Great Basin section occur in California.

Subsection 341Fa
Silver Peak Mountains - Fish Lake Valley

This subsection is east of the White Mountains. It includes the Silver Peak Mountains, Palmetto Mountains, Magruder Mountain, Sylvania Mountains, and Fish Lake Valley. It has a temperate to cold, arid climate. MLRA 29f.

Lithology and Stratigraphy. The bedrock is mainly Jurassic and Cretaceous granitic; Tertiary and Quaternary andesite and basalt; Tertiary silicic pyroclastic; Precambrian sedimentary; and early Paleozoic, mostly Ordovician, sedimentary rocks. Quaternary alluvium covers about one-half of the subsection.

Geomorphology. This subsection contains steep mountains, moderately steep hills, gently to moderately sloping alluvial fans, and nearly level floodplain and basin floor. The mountains are aligned north-south on the west side of Clayton Valley (adjacent subsection) and curve around the south end of the valley toward the northeast on the east side of Clayton Valley. The elevation range is from about 4700 feet in Fish Lake Valley up to 9407 feet in the Silver Peak Mountains. Mass wasting, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils on granitic rocks, which is the predominant kind of rock in California, are mostly shallow Typic and Xeric Torriorthents and shallow Aridic Haploxerolls. Soils on older alluvial fans are mostly Xerollic and Duric Haplargids. Those on younger fans and basin floors are mostly Typic and Oxiaquic Torriorthents and Aeric Halaquepts. The soils are well drained, except for poorly drained soils on basin floors. Soil temperature regimes are mesic and frigid. Soil moisture regimes are mostly aridic, but some are aquic on basin floors.

Vegetation. The predominant natural plant communities are Big sagebrush series at lower elevations and Singleleaf pinyon series at higher elevations. Low sagebrush series is common on shallow soils. On somewhat poorly to poorly drained floodplains and basin floors there are Greasewood series and Saltgrass series.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, Indian ricegrass series, Needle-and-thread series, Saltgrass series, Mulefat series.

Shrublands: Big sagebrush series, Bitterbrush series, Greasewood series, Hop-sage series. Low sagebrush series, Rubber rabbitbrush series, Shadscale series.

Forests and woodlands: Curlleaf mountain-mahogany series, Singleleaf pinyon series, Utah juniper series.

Climate. The mean annual precipitation is about 5 to 10 inches. Much of the precipitation is snow. Mean annual temperature is about 40° to 52° F. The mean freeze-free period is in the range from 100 to 200 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin floors. It drains to a salt flat in Fish Lake Valley.

Subsection 341Fb
Inyo Mountains

This subsection includes the Inyo Mountains, Malpais Mesa at the south end of the Inyo Mountains, and Deep Spring Valley. It has a temperate to cold, arid climate. MLRA 29f.

Lithology and Stratigraphy. The bedrock is mainly Mesozoic granitic; Precambrian sedimentary and metamorphic; Paleozoic marine sedimentary; Triassic marine sedimentary; and Triassic - Jurassic metavolcanic rocks. Nearly all of the Paleozoic is represented, from Cambrian through Permian. Bedrock on and around Malpais Mesa is Pliocene volcanic rocks, mostly basalt. The Quaternary is represented by both alluvial and lacustrine deposits in Warm Spring Valley and alluvial deposits in other much smaller valleys in the Inyo Mountains.

Subsection 341Fb, Inyo Mountains
from Saline Valley (341Fc) — *James R. Nelson*

Geomorphology. This subsection contains steep mountains, gently to moderately sloping alluvial fans and mesa, and nearly level floodplain and basin floor. The mountains are aligned north-northwest, except southeast of Deep Spring Valley where they are aligned north-northeast. The elevation range is from about 4000 feet up to 11,124 feet on Waucoba Mountain in the Inyo Mountains. Mass wasting, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils are mostly Lithic Torriorthents, Lithic Xerollic Haplargids, and Lithic and Aridic Argixerolls. On granitic rocks they are mostly shallow Typic Torriorthents and shallow Entic Haploxerolls. Soils on alluvial fans and basin floors are mostly Typic Torriorthents, Xerollic Camborthids, and Typic Durargids, plus Xerollic Haplargids on older alluvial fans. The soils are well drained. Soil temperature regimes are mesic and frigid. Soil moisture regimes are mostly aridic, and some xeric.

Vegetation. The predominant natural plant communities are Big sagebrush series at lower and Singleleaf pinyon series at higher elevations. Low sagebrush series is common on shallow soils. Limber pine series and Bristlecone pine series occur at high elevations in the Inyo Mountains. Shadscale series, Mixed saltbush series, and Desert scrub shrublands predominate at lower elevations at the southern end of the subsection. Other communities and habitats in this subsection include Curlleaf mountain mahogany series, Aspen series where snow accumulates, Willow thicket shrublands and Montane meadow habitats.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, Beaked sedge series, Creeping ryegrass series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.

Shrublands: Big sagebrush series, Black bush series, Bitterbrush series, Catclaw acacia series, Creosote bush series, Hop-sage series. Low sagebrush series, Rabbit rubberbrush series.

Forests and woodlands: Bristlecone pine series, Curlleaf mountain-mahogany series, Limber pine series, Singleleaf pinyon series, Singleleaf pinyon - Utah juniper series, Utah juniper series.

Climate. The mean annual precipitation is about 8 to 16 inches. Much of the precipitation is snow. Mean annual temperature is about 35° to 54° F. The mean freeze-free period is in the range from 75 to 225 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin floors. It drains to closed basins in the Owens Valley on the west, Eureka and Saline Valley on the east, or to Deep Spring Valley on the north. Streams are dry most of each year. There is a lake on the lacustrine plain in Deep Spring Valley.

Subsection 341Fc Saline Valley - Cottonwood Mountains

This subsection is between the Inyo Mountains and Death Valley. It includes the Last Chance Range, Saline Range, Cottonwood Mountains, Nelson Range, Saline Valley, Eureka Valley, and many smaller valleys. It has a hot to temperate, arid climate. MLRA 29f.

Lithology and Stratigraphy. The bedrock is mainly Mesozoic granitic; Paleozoic marine sedimentary; and Tertiary volcanic rocks. Most all of the Paleozoic is represented, at least from Cambrian through Carboniferous. Pliocene volcanic rocks are mostly basalt, but there are other Tertiary volcanic rocks that are silicic.

Subsection 341Fc, Saline Valley area — *James R. Nelson*

The Quaternary is represented by both alluvial and, in Saline, Eureka, and Racetrack Valleys, lacustrine deposits. Eolian sand deposits are extensive in Saline and Eureka Valleys.

Geomorphology. This subsection contains steep mountains, moderately steep hills, gently to moderately sloping alluvial fans and pediments, and nearly level floodplain and basin floor. Most of the mountains are aligned north-south, but the Nelson Range is aligned toward the northwest. There are high plateaus in the Nelson Range and on Hunter Mountain that appear to be old pediments. The elevation range is from about 1100 feet up to 7063 in the Saline Range, 7701 in the Nelson Range, 7454 on Hunter Mountain, 8456 in the Last Chance Range, and 8953 feet on Tin Mountain in the Cottonwood Mountains. Mass wasting, fluvial and eolian erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils on mountains and hills are mostly Lithic Torriorthents and Aridic Argixerolls, plus shallow Typic Torriorthents and shallow Aridic Haploxerolls on granitic rocks and Lithic Haplargids on volcanic rocks. Soils on alluvial fans and basin floors are mostly Typic and Xeric Torriorthents, plus Xerollic Haplargids and shallow Durorthids on older alluvial fans. There are Typic Salorthids on lacustrine deposits. The soils are well drained, except for poorly drained soils on lacustrine deposits. Soil temperature regimes are mostly thermic and mesic, with some frigid at higher elevations. Soil moisture regimes are aridic, except aquic in some lacustrine deposits.

Vegetation. The predominant natural plant communities, from lower to higher elevations, are Desert scrub shrublands and Mixed saltbush series on and around basin floors, Creosote bush series, Black bush series, Big sagebrush series, and Singleleaf pinyon series. Pickleweed series, Saltgrass series, and Greasewood series occur around poorly drained lake plains.

> **Characteristic series by lifeform include:**
> *Grasslands*: Alkali sacaton series, Indian ricegrass series, Pickleweed series, Saltgrass series.
>
> *Shrublands*: Black bush series, Catclaw acacia series, Creosote bush series, Fourwing saltbush series, Greasewood series, Hop-sage series. Iodine bush series, Mixed saltbush series, Shadscale series, Mulefat series.
>
> *Forests and woodlands*: Curlleaf mountain-mahogany series, Singleleaf pinyon series, Singleleaf pinyon - Utah juniper series, Utah juniper series.

Climate. The mean annual precipitation is about 5 to 12 inches. Much of the precipitation is snow at higher elevations. Mean annual temperature is about 40° to 70° F. The mean freeze-free period is in the range from 125 to 275 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin floors. Some of it drains to Death Valley and the remainder drains to closed basins within the subsection. Streams are dry most of each year.

Subsection 341Fd
Grapevine Mountains

This subsection includes the Grapevine Mountains on the northeast side of Death Valley and the Slate Range and Gold Mountain north of the Grapevine Mountains. It has a hot to temperate, arid climate. MLRA 29f.

Lithology and Stratigraphy. The bedrock is mainly Paleozoic marine sedimentary and Tertiary and Quaternary volcanic rocks, plus Jurassic granitic rocks in the Slate Range. Most of the Paleozoic is represented, at least from Cambrian through Carboniferous. The volcanic rocks are mostly basalt and pyroclastics. There is some Quaternary alluvium in small valleys.

Geomorphology. This subsection contains steep mountains, moderately steep hills, and gently to moderately sloping alluvial fans. Most of the Grapevine Mountains are aligned toward the north-west and the Slate Range and Gold Mountain are slightly curved toward the north-northeast to northeast. The elevation range is from about 1000 feet up to 8331 in the Grapevine Mountains. Mass wasting, fluvial and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils are mostly Lithic Torriorthents, shallow Typic and Xerollic Haplargids, and Aridic Argixerolls, plus Lithic Haplargids on volcanic rocks. Soils on alluvial fans are mostly Typic Torriorthents, Typic Haplargids, and shallow Typic Durorthids. The soils are well drained. Soil temperature regimes are thermic and mesic. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities, from lower to higher elevations are Mixed salt bush series, Shadscale series, Black bush series, Big sagebrush series, and Singleleaf pinyon series.

> **Characteristic series by lifeform include:**
> *Grasslands*: Indian ricegrass series, Needle-and-thread series.
>
> *Shrublands*: Black bush series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Hop-sage series, White bursage series.
>
> *Forests and woodlands*: Bristlecone pine series, Curlleaf mountain-mahogany series, Singleleaf pinyon series, Singleleaf pinyon - Utah juniper series, Utah juniper series.

Climate. The mean annual precipitation is about 4 to 10 inches. Much of the precipitation is snow at higher elevations. Mean annual temperature is about 40° to

72° F. The mean freeze-free period is in the range from 150 to 275 days.

Surface Water. Runoff is rapid. It drains to Death Valley on the southwest or to Sarcobatus Flat or the Amargosa River on the east. Streams are dry most of each year.

Subsection 341Fe
Cosa - Argus Ranges

This subsection is between the Owens Valley and Panamint Valley. It includes the Coso and Argus Ranges and hills and valley between the two mountain ranges. It has a hot to temperate, arid climate. MLRA 29f.

Lithology and Stratigraphy. The bedrock is mainly Mesozoic granitic; Paleozoic marine sedimentary; Pre-Cretaceous metamorphic; and Pliocene and Pleistocene volcanic rocks. Most of the Paleozoic is represented, at least from Ordovician through Permian. The volcanic rocks are mostly basalt, but there are also some pyroclastic rocks. The Quaternary is well represented by alluvium.

Subsection 341Fe, south of Nelson Range — *James R. Nelson*

Geomorphology. This subsection contains steep mountains, moderately steep hills, gently to moderately sloping alluvial fans and pediments, and nearly level floodplain and basin floor. Most of the mountains are aligned north-south, but the Darwin Hills and Santa Rosa Hills are aligned more toward the north-northwest. There are high plateaus, such as Joshua Flat at the north end of the Coso Range, that appear to be old pediments. Cinder cones are common in areas of Pleistocene volcanism. The elevation range is from about 2000 feet up to 8160 in the Coso Range and 8839 feet on Maturago Peak in the Argus Range. Mass wasting, fluvial erosion and deposition, and freeze-thaw are the main geomorphic processes.

Soils. The soils on mountains and hills are mostly Lithic Torriorthents, Lithic Camborthids, and Aridic Argixerolls, plus shallow Typic Torriorthents and shallow Aridic Haploxerolls on granitic rocks and Lithic Haplargids on volcanic rocks. Soils on alluvial fans and basin floors are mostly Typic and Xeric Torrifluvents and Torriorthents, plus Xerollic Haplargids on older alluvial fans. The soils are well drained. Soil temperature regimes are thermic and mesic. Soil moisture regimes are aridic.

Vegetation. The predominant natural plant communities, from lower to higher elevations are Creosote bush series, Mixed saltbush series, Black bush series, Big sagebrush series, and Singleleaf pinyon series. Also, Joshua tree series occurs at lower elevations.

Characteristic series by lifeform include:

Grasslands: Indian ricegrass series, Needle-and-thread series.

Shrublands: Big sagebrush series, Black bush series, Brittlebush series, Creosote bush series, Creosote bush - white bursage series, Hop-sage series, Joshua tree series, White bursage series.

Forests and woodlands: Curlleaf mountain-mahogany series, Singleleaf pinyon series, Singleleaf pinyon - Utah juniper series, Utah juniper series.

Climate. The mean annual precipitation is about 5 to 12 inches. Much of the precipitation is snow at higher elevations. Mean annual temperature is about 40° to 66° F. The mean freeze-free period is in the range from 125 to 250 days.

Surface Water. Runoff is rapid from alluvial fans and slow from basin floors. It drains to either Owens Valley or Panamint Valley. Streams are dry most of each year.

Subsection 341Ff
Panamint Range

This subsection comprises the Panamint Mountains, which are between Panamint Valley and Death Valley. It has a hot to cold, arid climate. MLRA 29f.

Lithology and Stratigraphy. The bedrock is mainly Precambrian sedimentary and metamorphic, Paleozoic marine sedimentary, and lesser amounts of Mesozoic granitic and Pliocene volcanic rocks. Most of the Paleozoic is represented, at least from Cambrian through Carboniferous. The volcanic rocks are mostly basalt. There is a little Quaternary alluvium in small valleys.

Geomorphology. This subsection contains steep mountains and gently to moderately sloping alluvial fans. The Panamint Range is aligned north-south. The elevation range is from about 1000 feet up to 11049 feet on Telescope Peak in the Panamint Range. Mass wasting, fluvial and deposition, and freeze-thaw are the main geomorphic processes.

Subsection 341Ff, Panamint Range area,
Inyo Mountains in background —*James R. Nelson*

Soils. The soils are mostly Lithic Torriorthents, Lithic Argixerolls, and Aridic Argixerolls, plus shallow Typic Torriorthents and shallow Aridic Argixerolls on granitic rocks and Lithic Haplargids on volcanic rocks. Soils on alluvial fans are mostly Typic Torriorthents and Xerollic Haplargids. The soils are well drained. Soil temperature regimes are mostly thermic and mesic, with frigid at higher elevations. Soil moisture regimes are mostly aridic, and some xeric.

Vegetation. The predominant natural plant communities, from lower to higher elevations are Creosote bush series, Mixed saltbush series, Shadscale series, Big sagebrush series, Singleleaf pinyon series, Limber pine series, and Bristlecone pine series.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, Creeping ryegrass series, Indian ricegrass series, Nebraska sedge series, Needle-and-thread series.

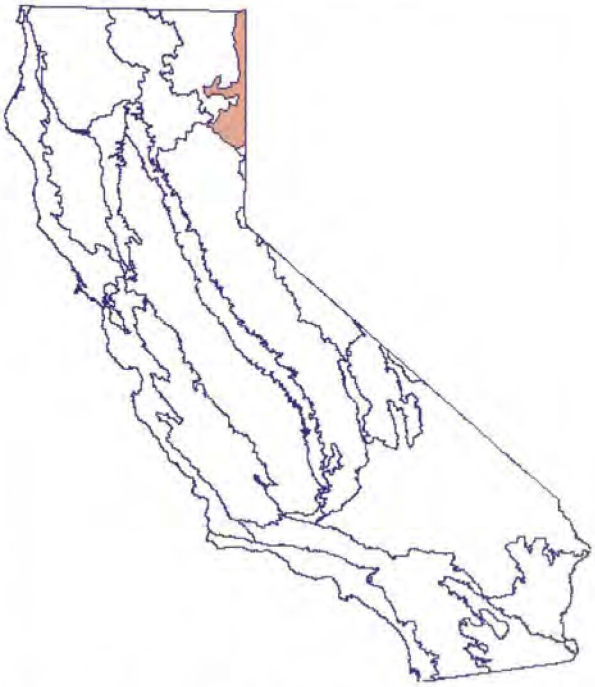
Shrublands: Big sagebrush series, Black bush series, Brittlebush series, Catclaw acacia series, Creosote bush series, Creosote bush - white bursage series, Hop-sage series, Low sagebrush series, Shadscale series, White bursage series.

Forests and woodlands: Bristlecone pine series, Curlleaf mountain-mahogany series, Limber pine series.

Climate. The mean annual precipitation is about 4 to 20 inches. Much of the precipitation is snow at higher elevations. Mean annual temperature is about 35° to 72° F. The mean freeze-free period is in the range from 100 to 275 days.

Surface Water. Runoff is rapid. It drains to either Panamint Valley on the west or Death Valley on the east. Streams are dry most of each year.

CHAPTER 19



Section 342B Northwestern Basin and Range

This section comprises the northern, and particularly the northwestern, part of the Great Basin in the Basin and Range Province. It is in MLRA 23.

Geomorphology. Isolated ranges (largely dissected block mountains) separated by aggraded desert plains. Basin and Range geomorphic province.

Lithology. Quaternary alluvial and lacustrine deposits, and Pliocene and Miocene volcanic rocks.

Soil Taxa. Aridisols, Entisols, Inceptisols and Mollisols in combination with frigid and mesic soil temperature regimes and aridic and xeric soil moisture regimes. Includes areas of salt affected soils.

Vegetation. Predominant potential natural communities includes the Big sagebrush series, Mixed saltbush series, Greasewood series and Shadscale series.

The following series are found throughout the California part of the section and are not restricted to or extensive in any subsection. Series dominated by exotic plants are not listed under subsections unless they are extensive and stable.

> *Series dominated by exotic plants*: Cheatgrass series, Crested wheatgrass series, Introduced perennial grassland series and Kentucky bluegrass series.
>
> *Series that can occur in all subsections, but are not extensive*: Bulrush series, Bulrush - cattail series, Bur-reed series, Cattail series, Cordgrass series, Duckweed series, Mosquito fern series, One-sided bluegrass series, Pondweeds with floating leaves series, Pondweeds with submerged leaves series, Sedge series and Spikerush series.
>
> *Series restricted to riparian settings*: Arroyo willow series, Black willow series, Common reed series, Mixed willow series, Narrowleaf willow series, Red willow series and Water birch series.

Fauna. Reserved

Elevation. 4000 to 8000 feet.

Precipitation. 4 to 20 inches.

Temperature. 30° to 52°F.

Growing Season. 25 to 150 days.

Surface Water Characteristics. Few moderately slow rivers and streams in deeply incised canyons with bedrock controlled channels (higher elevations) to alluvial channels (lower elevations) that terminate in basins or lakes within the section, or in basins and lakes in the Bonneville Basin section. A few large lakes occur within the section.

Disturbance Regimes.
Fire: Infrequent, low and moderate intensity fires, and high intensity stand replacing fires.

Land Use. Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to mining, grazing, and agricultural and recreational activities.

Cultural Ecology. To be written

Subsections. Five subsections of the Northwestern Basin and Range Section occur in California.

Section 342B, Surprise Valley — *James R. Nelson*

Subsection 342Ba Surprise Valley

This subsection comprises the Surprise Valley, which is east of the Warner Mountains. The climate is temperate, and semi-arid. MLRAs 23f and 23g.

Lithology and Stratigraphy. Quaternary alluvial and lacustrine deposits predominate in this subsection. There are minor eolian deposits.

Geomorphology. Very gently to moderately sloping alluvial fans and nearly level floodplain and basin floors predominate in this subsection. Most of the basin floor is a lake plain with remnants of a formerly much larger lake. The valley is aligned north-south, parallel to the Warner Mountains from which it is separated by the Surprise Valley Fault. The elevation range is about 4430 to 5100 feet. Fluvial erosion and deposition, lacustrine deposition, and freeze-thaw are the main geomorphic processes.

Soils. Soils on alluvial fans and floodplains are mostly Aridic Haploxerolls and Fluvaquentic Endoaquolls. Those on basin floors are mostly Durixerollic Haplargids, Xerollic Natrargids, Duric Camborthids, Aeric Haplaquepts, and Oxyaquic Torriorthents. The soils are well to poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are mostly aridic on alluvial fans and aquic on basin floors.

Vegetation. The predominant natural plant communities are Big sagebrush series on fans, and Mixed saltbush series, Greasewood series, Saltgrass series, and Sedge meadow communities on floodplains and basin floors.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, Ashy ryegrass series, Beaked sedge series, Creeping ryegrass series, Indian ricegrass series, Needle-and-thread series, Saltgrass series.

Shrublands: Big sagebrush series, Bitterbrush series, Bush seepweed series, Fourwing saltbush series, Greasewood series, Low sagebrush series, Mixed saltbush series, Rubber rabbitbrush series, Shadscale series.

Subsection 342Ba, Surprise Valley — *James R. Nelson*

Climate. The mean annual precipitation is about 4 to 16 inches. Much of the precipitation is snow. Mean annual temperature is about 45° to 50° F. The mean freeze-free period is in the range from 100 to 125 days.

Surface Water. Runoff is rapid from alluvial fans and slow on basin floors. Surprise Valley has a closed drainage system. There are currently three lakes in the valley, where there was one larger lake during the Pleistocene. Only larger streams draining into the valley are perennial; smaller streams are dry during summer.

Subsection 342Bb Sheldon Range

This subsection is a volcanic plateau northeast of Surprise Valley. The climate is temperate to cold, and semi-arid. MLRAs 21e and 23f.

Lithology and Stratigraphy. The bedrock is predominantly Miocene basalt and lesser amounts on Miocene rhyolite and pyroclastic rocks. There are some alluvial and lacustrine deposits in small depressions.

Geomorphology. Gently to moderately sloping plateau with few moderately steep hills predominates in this subsection. The fault-line scarp on the eastern edge of Mount Bidwell, which is on the western margin of the subsection, is steep. The plateau lacks a well integrated drainage system; there are many small closed depressions. The elevation range is about 4500 to 6000 feet on the plateau and up to 8000 feet on a fault-line scarp along the western edge of the subsection. Fluvial erosion and deposition and freeze-thaw are the main geomorphic processes. Volcanism is no longer an active process.

Soils. Soils are mostly Lithic Xerollic Haplargids, Lithic and Pachic Argixerolls, Xerollic Natrargids, Abruptic Xerollic Durargids, and Pachic and Argic Cryoborolls. The soils are well drained. Soil temperature regimes are mostly frigid and cryic, but mesic around the alluvial plain in Surprise Valley. Soil moisture regimes are mostly aridic and xeric.

Vegetation. The predominant natural plant community is Big sagebrush series. Shadscale series occurs in the drier areas. Rubber rabbitbrush series occurs on disturbed sites.

Characteristic series by lifeform include:
Grasslands: Ashy ryegrass series, Bluebunch wheatgrass series, Creeping ryegrass series, Indian ricegrass series, Needle-and-thread series.

Shrublands: Big sagebrush series, Bitterbrush series, Low rabbitbrush series, Rubber rabbitbrush series.

Forests and woodlands: Curlleaf mountain-mahogany series.

Climate. The mean annual precipitation is about 10 to 20 inches. Much of the precipitation is snow. Mean annual temperature is about 30° to 48° F. The mean freeze-free period range is from 25 to 125 days.

Surface Water. Runoff from uplands is rapid, but water ponds in small depressions. Most of the drainage is internal, to closed depressions in the subsection. There are few streams and most of those are dry during summer.

Subsection 342Bc
Honey Lake Basin

This subsection comprises the bottom of Honey Lake Valley, just northwest of the Diamond Mountains, which are at the northwest end of the Sierra Nevada. The climate is temperate and arid to semi-arid. MLRAs 23f and 23g.

Lithology and Stratigraphy. Quaternary alluvial and lacustrine deposits predominate in this subsection. There are minor eolian deposits. Some Tertiary andesite and pyroclastic rocks are included in this subsection.

Geomorphology. Gently sloping to nearly level alluvial fans, floodplain, and basin floor predominate in this subsection, forming a large alluvial - lacustrine plain.

Subsection 342Bc, near Honey Lake — *James R. Nelson*

Slopes are moderately steep to steep on Bald Mountain, which is near the center of this alluvial - lacustrine plain. Honey Lake is a remnant of much larger Pleistocene and older lakes that occupied the valley. There are small remnants of Tertiary lacustrine and Quaternary fluvial terraces. Tufa mounds are common. The valley is aligned toward the north-west, parallel to the very steep northeastern edge of the Diamond Mountains. The elevation range is about 3980 feet on the current surface of Honey Lake to 4200 feet on the alluvial - lacustrine plain and 5221 feet on Bald Mountain. Fluvial and eolian erosion and deposition, lacustrine deposition, and freeze-thaw are the main geomorphic processes.

Soils. Soils on bedrock are mostly Pachic Haploxerolls, and Aridic and shallow Aridic Argixerolls. Those on the alluvial - lacustrine plains are Typic, Xerollic, and Natric Camborthids; Torripsammentic, Cumulic, Fluvaquentic, Calcidic, and Aridic Duric Haploxerolls; Aridic Argixerolls; Xerollic and Durixerollic Haplargids; Haploxerollic and Durixerollic Natrargids; Fluvaquentic Endoaquolls; Aeric Halaquepts; and Xeric Endoaquerts. The soils are well to poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are mostly aridic and aquic, and some xeric on the north side of Bald Mountain.

Vegetation. The predominant natural plant communities on well drained soils are Big sagebrush series on the west and Shadscale series on the east. On somewhat poorly to poorly drained soils, the predominant natural plant communities are Mixed saltbush series and Saltgrass series and Sedge meadow communities.

Characteristic series by lifeform include:
Grasslands: Alkali sacaton series, Ashy ryegrass series, Bluebunch wheatgrass series, Creeping ryegrass series, Indian ricegrass series, Needle-and-thread series, Saltgrass series.
Shrublands: Big sagebrush series, Bush seepweed series, Fourwing saltbush series, Greasewood series, Mixed saltbush series, Rubber rabbitbrush series, Scadscale series, Winter fat series.
Forests and woodlands: Mountain juniper series, Western juniper series.

Climate. The mean annual precipitation is about 4 to 8 inches. Much of the precipitation is snow. Mean annual temperature is about 48° to 52° F. The mean freeze-free period is in the range from 100 to 150 days.

Surface Water. The Susan River entering the valley from the northwest, Willow from the north, and several streams from the Diamond Mountains are perennial, but all streams on the east side of the valley are dry during summer.

Subsection 342Bd
Cottonwood - Skedaddle Mountains

This subsection is on the drier margin of the Modoc Plateau between Surprise Valley and Honey Lake. The climate is temperate to cold and semi-arid. MLRAs 23f and 23g.

Lithology and Stratigraphy. The bedrock is predominantly Pliocene and Quaternary basalt and lesser amounts of older Tertiary pyroclastic rocks and sediments. Quaternary alluvial deposits are inextensive and

Tertiary and Quaternary lacustrine deposits are moderately extensive.

Geomorphology. There are many volcanic peaks with steep sideslopes and gently to moderately sloping lava flow surfaces between peaks. There has been enough fluvial erosion to form locally integrated drainage systems, but not enough to drain all basins nor to severely dissect lacustrine sediments in basins that have been drained naturally. A few drainages remain closed, but most streams drain to closed basins outside of this subsection. The elevation range is from about 4200 feet up to 7552 feet in the Skedaddle Mountains. There are many peaks between 6000 to 7000 feet elevation. Fluvial erosion and freeze-thaw are the main geomorphic processes. Volcanism is no longer an active process.

Soils. Soils in volcanic terrain are mostly Lithic and Aridic Argixerolls and lesser amounts of Cryoborolls, Camborthids, Haplargids, and Haploxererts. Those on alluvial and lacustrine plains are Cumulic, Fluvaquentic, and Aridic Duric Haploxerolls; Aridic Argixerolls; Xerollic and Durixerollic Haplargids; and Chromic Haploxererts. Most of the soils are well drained; some are somewhat poorly drained. Soil temperature regimes are mostly mesic and frigid, with some cryic on north-facing slopes at higher elevations. Soil moisture regimes are mostly aridic, but some are xeric on alluvial and lacustrine plains.

Vegetation. The predominant natural plant communities are Big sagebrush series on the west and Shadscale series on the east side of the subsection. Also, there is some Low sagebrush series on shallow soils and Western juniper series in the western part of the subsection.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, Breaked sedge series, Bluebunch wheatgrass series, Creeping ryegrass series, Indian ricegrass series, One-sided bluegrass series.

Shrublands: Big sagebrush series, Bitterbrush series, Fourwing saltbush series, Low sagebrush series, Rubber rabbitbrush series, Shadscale series.

Forests and woodlands: Curlleaf mountain-mahogany series, Western juniper series.

Climate. The mean annual precipitation is about 6 to 12 inches. Much of the precipitation is snow. Mean annual temperature is about 35° to 50° F. The mean freeze-free period is in the range from 50 to 125 days.

Surface Water. Runoff is rapid from uplands and slow on alluvial and lacustrine plains. Most of the drainage is to Honey Lake Valley on the south, Smoke Creek Valley on the east, or Surprise Valley on the north; little is to closed basins within the subsection. Most of the streams are dry during summer.

Subsection 342Be Madeline Plains

This subsection comprises the Madeline Plains and contiguous plains in Grasshopper and Dry Valleys. They are near the eastern edge of the Modoc Plateau. The climate is temperate and semi-arid.

Lithology and Stratigraphy. Quaternary lacustrine deposits predominate in this subsection. There is some Pliocene basalt, minor Quaternary alluvial and eolian deposits.

Geomorphology. Nearly level lake plain predominates in this subsection. There are a few small, sloping to moderately steep hills sticking up through the lacustrine plain and eolian sand deposits on the east side of the plain. The elevation range is from 5284 feet to about 5400 feet on the alluvial - lacustrine plain and up to 5741 feet on Dill Butte. Fluvial and eolian erosion and deposition, lacustrine deposition, and freeze-thaw are the main geomorphic processes.

Soils. Soils on bedrock are mostly Lithic and Typic Argixerolls and Entic Chromoxererts. Those on the lacustrine plain are Chromic Haploxererts; Cumulic, Fluvaquentic, and Aridic Duric Haploxerolls; Aridic Argixerolls; and Xerollic and Durixerollic Haplargids. The soils are well to somewhat poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are mostly aridic and xeric.

Vegetation. The predominant natural plant communities are Big sagebrush series and, on somewhat poorly to poorly drained soils, Sedge meadow communities.

Characteristic series by lifeform include:

Grasslands: Ashy ryegrass series, Breaked sedge series, Creeping ryegrass series, Indian ricegrass series.

Shrublands: Big sagebrush series, Bitterbrush series, Low sagebrush series, Rubber rabbitbrush series.

Climate. The mean annual precipitation is about 8 to 12 inches. Much of the precipitation is snow. Mean annual temperature is about 45° to 48° F. The mean freeze-free period is in the range from 75 to 100 days.

Surface Water. There is no overland drainage from the Madeline Plain, but streams from the surrounding area are dry much of each year and carry too little water to the plain to create a lake.

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Appendix B - Areas of Sections and Subsections

Note: All section and subsection acreages reflect only totals within California. Total acreages for those subsections which extend beyond the California border will be determined once Oregon and Nevada subsection mapping is completed.

Section 261A - *Central California Coast*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
261Aa	215,400	6.3	0.2
261Ab	61,040	1.8	0.1
261Ac	289,430	8.5	0.3
261Ad	125,230	3.7	0.1
261Ae	291,580	8.6	0.3
261Af	486,990	14.3	0.5
261Ag	158,400	4.7	0.2
261Ah	403,720	11.9	0.4
261Ai	47,960	1.4	0.0
261Aj	623,010	18.3	0.6
261Ak	557,290	16.4	0.6
261Al	146,120	4.3	0.1
Total	**3,406,170**	**100.0**	**3.4**

Section 261B - *Southern California Coast*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
261Ba	416,190	11.6	0.4
261Bb	563,790	15.8	0.6
261Bc	127,080	3.6	0.1
261Bd	170,980	4.8	0.2
261Be	233,790	6.5	0.2
261Bf	179,020	5.0	0.2
261Bg	919,050	25.7	0.9
261Bh	67,540	1.9	0.1
261Bi	617,440	17.3	0.6
261Bj	283,020	7.9	0.3
Total	**3,577,900**	**100.0**	**3.5**

Section 262A - *Great Valley*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
262Aa	477,980	3.9	0.5
262Ab	78,430	0.6	0.1
262Ac	376,950	3.1	0.4
262Ad	307,660	2.5	0.3
262Ae	39,400	0.3	0.0
262Af	263,540	2.2	0.3
262Ag	2,469,250	20.3	2.4
262Ah	380,060	3.1	0.4
262Ai	310,060	2.5	0.3
262Aj	86,670	0.7	0.1
262Ak	57,030	0.5	0.1
262Al	375,860	3.1	0.4
262Am	174,350	1.4	0.2
262An	53,500	0.4	0.1
262Ao	514,660	4.2	0.5
262Ap	111,190	0.9	0.1
262Aq	526,270	4.3	0.5
262Ar	112,340	0.9	0.1
262As	631,750	5.2	0.6
262At	313,100	2.6	0.3
262Au	1,696,460	14.0	1.7
262Av	403,870	3.3	0.4
262Aw	696,190	5.7	0.7
262Ax	311,060	2.6	0.3
262Ay	1,143,600	9.4	1.1
262Az	249,690	2.1	0.2
Total	**12,160,920**	**100.0**	**12.0**

Section 263A - *Northern California Coast*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
263Aa	37,850	0.9	0.0
263Ab	303,500	7.1	0.3
263Ac	71,460	1.7	0.1
263Ad	118,520	2.8	0.1
263Ae	181,070	4.2	0.2
263Af	477,390	11.2	0.5
263Ag	2,007,810	47.1	2.0
263Ah	55,300	1.3	0.1
263Ai	64,960	1.5	0.1
263Aj	260,350	6.1	0.3
263Ak	64,300	1.5	0.1
263Al	226,420	5.3	0.2
263Am	397,240	9.3	0.4
Total	**4,266,170**	**100.0**	**4.2**

Section M261A - *Klamath Mountains*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
M261Aa	461,590	8.3	0.5
M261Ab	156,360	2.8	0.2
M261Ac	190,740	3.4	0.2
M261Ad	283,890	5.1	0.3
M261Ae	497,080	8.9	0.5
M261Af	272,330	4.9	0.3
M261Ag	348,730	6.3	0.3
M261Ah	77,460	1.4	0.1
M261Ai	988,870	17.8	1.0
M261Aj	384,760	6.9	0.4
M261Ak	127,250	2.3	0.1
M261Al	194,240	3.5	0.2
M261Am	100,710	1.8	0.1
M261An	85,480	1.5	0.1
M261Ao	17,140	0.3	0.0
M261Ap	171,050	3.1	0.2
M261Aq	162,530	2.9	0.2
M261Ar	529,220	9.5	0.5
M261As	73,920	1.3	0.1
M261At	132,630	2.4	0.1
M261Au	312,450	5.6	0.3
Total	**5,568,430**	**100.0**	**5.5**

Section M261B - *Northern California Coast Ranges*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
M261Ba	1,251,950	32.7	1.2
M261Bb	1,931,500	50.4	1.9
M261Bc	121,470	3.2	0.1
M261Bd	161,310	4.2	0.2
M261Be	93,920	2.5	0.1
M261Bf	272,100	7.1	0.3
Total	**3,832,250**	**100.0**	**3.8**

Section M261C - *Northern California Interior Coast Ranges*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
M261Ca	923,830	49.9	0.9
M261Cb	730,110	39.5	0.7
M261Cc	196,070	10.6	0.2
Total	**1,850,010**	**100.0**	**1.8**

Section M261D - *Southern Cascades*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
M261Da	170,490	4.1	0.2
M261Db	52,660	1.3	0.1
M261Dc	125,270	3.0	0.1
M261Dd	443,850	10.7	0.4
M261De	75,190	1.8	0.1
M261Df	495,710	12.0	0.5
M261Dg	83,310	2.0	0.1
M261Dh	689,910	16.7	0.7
M261Di	238,530	5.8	0.2
M261Dj	444,520	10.7	0.4
M261Dk	9,200	0.2	0.0
M261Dl	562,640	13.6	0.6
M261Dm	744,850	18.0	0.7
Total	**4,136,130**	**100.0**	**4.1**

Section M261E - *Sierra Nevada*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
M261Ea	223,970	1.8	0.2
M261Eb	217,780	1.7	0.2
M261Ec	399,330	3.1	0.4
M261Ed	338,870	2.7	0.3
M261Ee	130,420	1.0	0.1
M261Ef	554,930	4.4	0.5
M261Eg	1,814,900	14.3	1.8
M261Eh	1,095,810	8.6	1.1
M261Ei	116,990	0.9	0.1
M261Ej	416,390	3.3	0.4
M261Ek	455,040	3.6	0.4
M261El	32,970	0.3	0.0
M261Em	562,260	4.4	0.6
M261En	193,270	1.5	0.2
M261Eo	1,868,500	14.7	1.8
M261Ep	996,870	7.9	1.0
M261Eq	1,155,790	9.1	1.1
M261Er	976,090	7.7	1.0
M261Es	500,220	3.9	0.5
M261Et	50,860	0.4	0.1
M261Eu	578,390	4.6	0.6
Total	**12,679,650**	**100.0**	**12.5**

Section M261F - *Sierra Nevada Foothills*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
M261Fa	674,190	15.0	0.7
M261Fb	1,886,800	41.8	1.9
M261Fc	1,319,340	29.3	1.3
M261Fd	459,060	10.2	0.5
M261Fe	169,550	3.8	0.2
Total	**4,508,940**	**100.0**	**4.5**

Section M261G - *Modoc Plateau*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
M261Ga	147,260	4.1	0.1
M261Gb	665,480	18.4	0.7
M261Gc	151,490	4.2	0.1
M261Gd	202,140	5.6	0.2
M261Ge	121,910	3.4	0.1
M261Gf	353,820	9.8	0.3
M261Gg	213,880	5.9	0.2
M261Gh	69,020	1.9	0.1
M261Gi	412,930	11.4	0.4
M261Gj	235,390	6.5	0.2
M261Gk	83,250	2.3	0.1
M261Gl	248,450	6.9	0.2
M261Gm	426,400	11.8	0.4
M261Gn	118,450	3.3	0.1
M261Go	103,530	2.9	0.1
M261Gp	58,070	1.6	0.1
Total	**3,611,470**	**100.0**	**3.6**

Section M262A - *Central California Coast Ranges*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
M262Aa	240,380	3.9	0.2
M262Ab	333,970	5.4	0.3
M262Ac	1,169,410	19.0	1.2
M262Ad	873,350	14.2	0.9
M262Ae	1,230,340	20.0	1.2
M262Af	599,130	9.8	0.6
M262Ag	258,740	4.2	0.3
M262Ah	634,740	10.3	0.6
M262Ai	213,020	3.5	0.2
M262Aj	358,830	5.8	0.4
M262Ak	230,240	3.7	0.2
Total	**6,142,150**	**100.0**	**6.1**

Section M262B - *Southern California Mountains and Valleys*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
M262Ba	709,300	10.4	0.7
M262Bb	544,680	8.0	0.5
M262Bc	224,880	3.3	0.2
M262Bd	389,760	5.7	0.4
M262Be	189,100	2.8	0.2
M262Bf	354,730	5.2	0.4
M262Bg	315,160	4.6	0.3
M262Bh	232,300	3.4	0.2
M262Bi	365,080	5.3	0.4
M262Bj	459,900	6.7	0.5
M262Bk	521,380	7.6	0.5
M262Bl	371,980	5.4	0.4
M262Bm	188,120	2.7	0.2
M262Bn	610,810	8.9	0.6
M262Bo	595,420	8.7	0.6
M262Bp	775,950	11.3	0.8
Total	**6,848,550**	**100.0**	**6.8**

Section 322A - *Mojave Desert*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
322Aa	450,630	2.7	0.4
322Ab	847,670	5.1	0.8
322Ac	426,230	2.6	0.4
322Ad	846,450	5.1	0.8
322Ae	252,690	1.5	0.2
322Af	848,690	5.1	0.8
322Ag	3,155,710	19.0	3.1
322Ah	1,998,520	12.0	2.0
322Ai	667,050	4.0	0.7
322Aj	899,090	5.4	0.9
322Ak	298,500	1.8	0.3
322Al	1,444,640	8.7	1.4
322Am	1,098,640	6.6	1.1
322An	1,478,720	8.9	1.5
322Ao	1,198,020	7.2	1.2
322Ap	699,260	4.2	0.7
Total	**16,610,510**	**100.0**	**16.4**

Section 322B - *Sonoran Desert*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
322Ba	1,140,080	35.4	1.1
322Bb	239,620	7.4	0.2
322Bc	509,040	15.8	0.5
322Bd	277,070	8.6	0.3
322Be	1,052,800	32.7	1.0
Total	**3,218,610**	**100.0**	**3.2**

Section 322C - *Colorado Desert*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
322Ca	487,800	17.8	0.5
322Cb	714,860	26.1	0.7
322Cc	691,210	25.2	0.7
322Cd	848,570	30.9	0.8
Total	2,742,440	100.0	2.7

Section 341D - *Mono*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
341Da	10,430	0.5	0.0
341Db	52,010	2.7	0.1
341Dc	19,420	1.0	0.0
341Dd	221,050	11.3	0.2
341De	269,410	13.8	0.3
341Df	158,140	8.1	0.2
341Dh	451,430	23.1	0.4
341Di	224,400	11.5	0.2
341Dj	345,980	17.7	0.3
341Dk	70,800	3.6	0.1
341Dl	132,570	6.8	0.1
Total	1,955,640	100.0	1.9

Section 341F - *Southeastern Great Basin*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
341Fa	56,860	2.0	0.1
341Fb	536,280	19.7	0.5
341Fc	951,140	34.9	0.9
341Fd	141,090	5.3	0.1
341Fe	660,690	24.2	0.7
341Ff	378,350	13.9	0.4
Total	2,724,410	100.0	2.7

Section 342B - *Northwestern Basin and Range*

Subsections	Acres	Extent in Section (%)	Extent in California (%)
342Ba	220,310	17.2	0.2
342Bb	87,780	6.9	0.1
342Bc	317,360	24.8	0.3
342Bd	468,700	36.6	0.5
342Be	185,770	14.5	0.2
	1,279,920	**100.0**	**1.3**

Total for all Sections

	Acres	Extent in California (%)
Grand Total	101,120,730	100.0

Appendix C - Glossary of Selected Terms

Included are definitions of selected terms that may not be commonly known to the user of this document. Further definition of geologic, soil and plant community classifications and terminology may be found in Bates and Jackson (1980) for geologic terms, Glossary of Soil Science Terms (1987) and Keys to Soil Taxonomy (1996) for soil terminology, and Sawyer and Keeler-Wolf (1995) for vegetation.

ALLUVIUM — A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment in the bed of the stream. (Bates and Jackson 1980.)

CIRQUE — A deep steep-walled half-bowl-like recess or hollow situated high on the side of a mountain and commonly at the head of a glacial valley, and produced by the erosive activity of a mountain glacier. (Bates and Jackson 1980.)

COLLUVIUM — A general term applied to any loose, heterogeneous, and incoherent mass of soil material and/or rock fragments deposited by rainwash, sheetwash, or slow continuous downslope creep, usually collecting at the base of gentle slopes or hillsides. (Bates and Jackson 1980.)

DIVISION — An ecological unit in the ecoregion planning and analysis scale of the National Hierarchical Framework corresponding to subdivisions of a Domain that have the same regional climate. (ECOMAP 1993.)

DOMAIN — An ecological unit in the ecoregion planning and analysis scale of the National Hierarchical Framework corresponding to subcontinental divisions of broad climatic similarity that are affected by latitude and global atmospheric conditions. (ECOMAP 1993.)

DRY — A classification of climate based on the Köppen System for regions where evaporation exceeds precipitation. (Bailey 1980.)

ECOREGION — A scale of planning and analysis in the National Hierarchical Framework that has broad applicability for modeling and sampling, strategic planning and assessment, and international planning. Ecoregions include Domain, Division, and Province ecological units.

ECOSYSTEM — A complete interacting system of organisms and their environment. (Forest Service Manual 2060.)

FLOODPLAIN — The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river in its existing regimen and covered with water when the river overflows its banks. (Bates and Jackson 1980.)

LIFE ZONES — A classification of macroclimatic conditions based on temperature and precipitation that has been widely applied in tropical environments to delineate zones dominated by vegetative communities of characteristic physiognomy and composition. (Holdridge 1967.)

MAJOR LAND RESOURCE AREA (MLRA) — A broad geographical area that has a distinct combination of climate, soil, vegetation, management needs, and kinds of crops that can be grown (USDA, Natural Resources Conservation Service, 1981).

MORAINE — A mound, ridge, or other distinct accumulation of unsorted, unstratified glacial drift, predominantly till, deposited chiefly by direct action of glacier ice, in a variety of topographic landforms that are independent of control by the surface on which the drift lies. (Bates and Jackson 1980.)

PLANT ASSOCIATION — A potential natural plant community of definite floristic composition and uniform appearance. (Forest Service Manual 2060.)

PLANT COMMUNITY — A group of one or more populations of plants in a common spatial arrangement. (Forest Service Manual 2060)

PLAYA — A term used in the southwestern U.S. for a dry, vegetation-free, flat area at the lowest part of an undrained desert basin, underlain by stratified clay, silt, or sand, and commonly by soluble salts. (Bates and Jackson 1980.)

POTENTIAL NATURAL COMMUNITY — The biotic community that would be established if all successional sequences of its ecosystem were completed without additional human-caused disturbance under present environmental conditions. Grazing by native fauna, natural disturbances, such as drought, floods, fire, insects, and disease, are inherent in the development of potential natural communities which may include naturalized exotic species. (Forest Service Manual 2060.)

PROVINCE — An ecological unit in the ecoregion planning and analysis scale of the National Hierarchical Framework corresponding to subdivisions of a Division that conform to climatic subzones controlled mainly by continental weather patterns. (ECOMAP 1993.)

REGIONALIZATION — A mapping procedure in which a set of criteria are used to subdivide the earth's surface into smaller, more homogeneous units that display spatial patterns related to ecosystem structure, composition, and function. (ECOMAP 1993.)

SCALE — The degree of resolution at which ecological processes, structures, and changes across space and time are observed and measured. (ECOMAP 1993.)

SECTION — An ecological unit in the subregion planning and analysis scale of the National Hierarchical Framework corresponding to subdivisions of a Province having broad areas of similar geomorphic process, stratigraphy, geologic origin, drainage networks, topography, and regional climate. Such areas are often inferred by relating geologic maps to potential natural vegetation groupings as mapped by Kiichler (1964). (ECOMAP 1993.)

SUBREGION — A scale of planning and analysis in the National Hierarchical Framework that has applicability for strategic, multi-forest, statewide, and multi-agency analysis and assessment. Subregions include Section and Subsection ecological units.

SUBSECTION — An ecological unit in the subregion planning and analysis scale of the National Hierarchical Framework corresponding to subdivisions of a Section into areas with similar surficial geology, lithology, geomorphic process, soil groups, subregional climate, and potential natural communities. (ECOMAP 1993.)

SUBTROPICAL — A classification of climate based on the Köppen System for regions where there are eight months or more warmer than 50° F and the coolest month is warmer than 32° F but colder than 65° F. (Bailey 1980.)

TEMPERATE — A classification of climate based on the Köppen System for regions where there are four to eight months warmer than 50° F and the coldest month is cooler than 32° F. (Bailey 1980.)

TROPICAL — A classification of climate based on the Köppen System for regions where the coolest month is warmer than 65° F (Bailey 1980).

VEGETATION SERIES — An aggregation of taxonomically related plant associations which take the name of the late seral stage species that dominate, or have the potential to dominate the principal vegetative layer in a time frame appropriate to the vegetation or taxonomic group under consideration.